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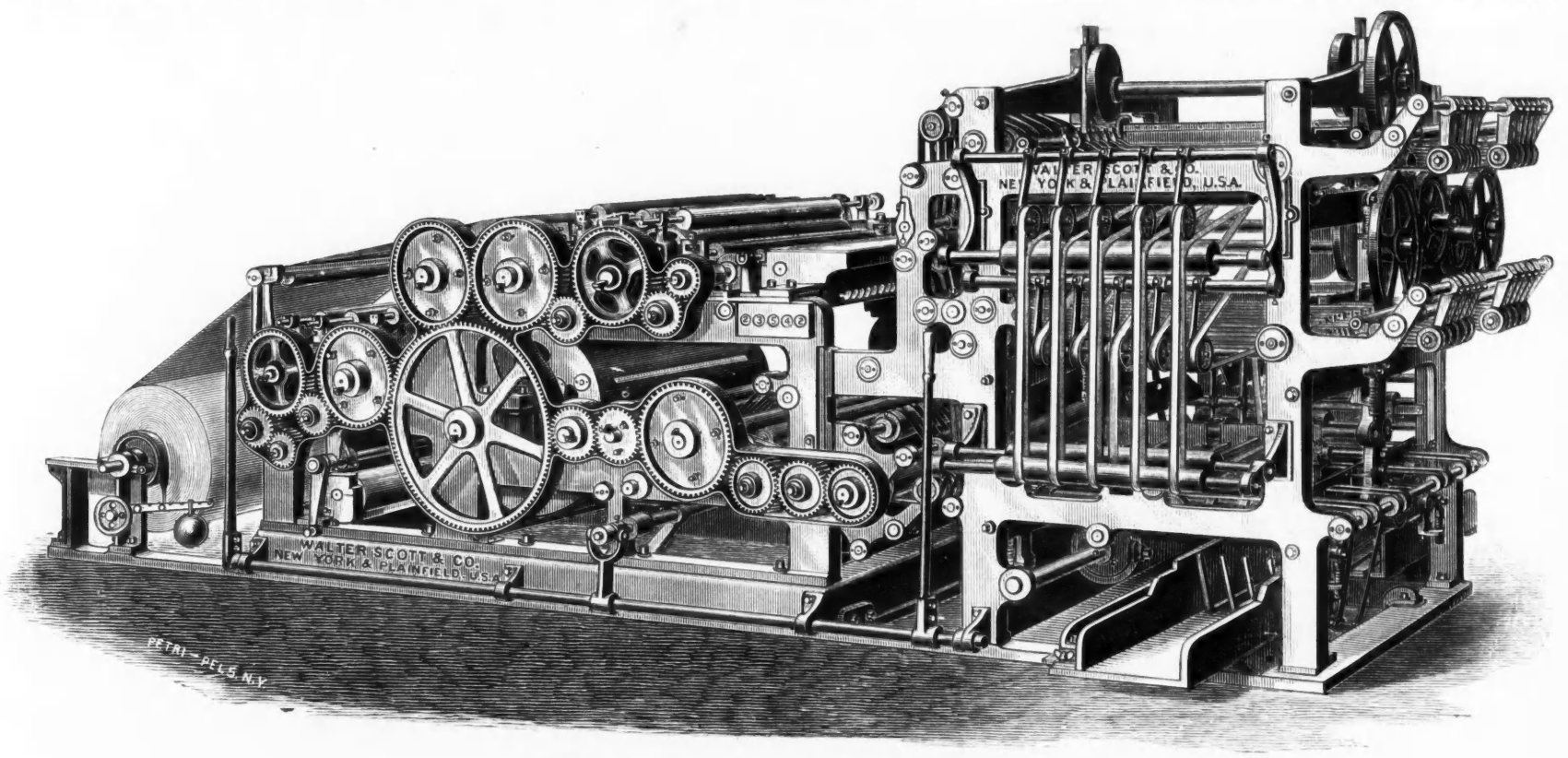
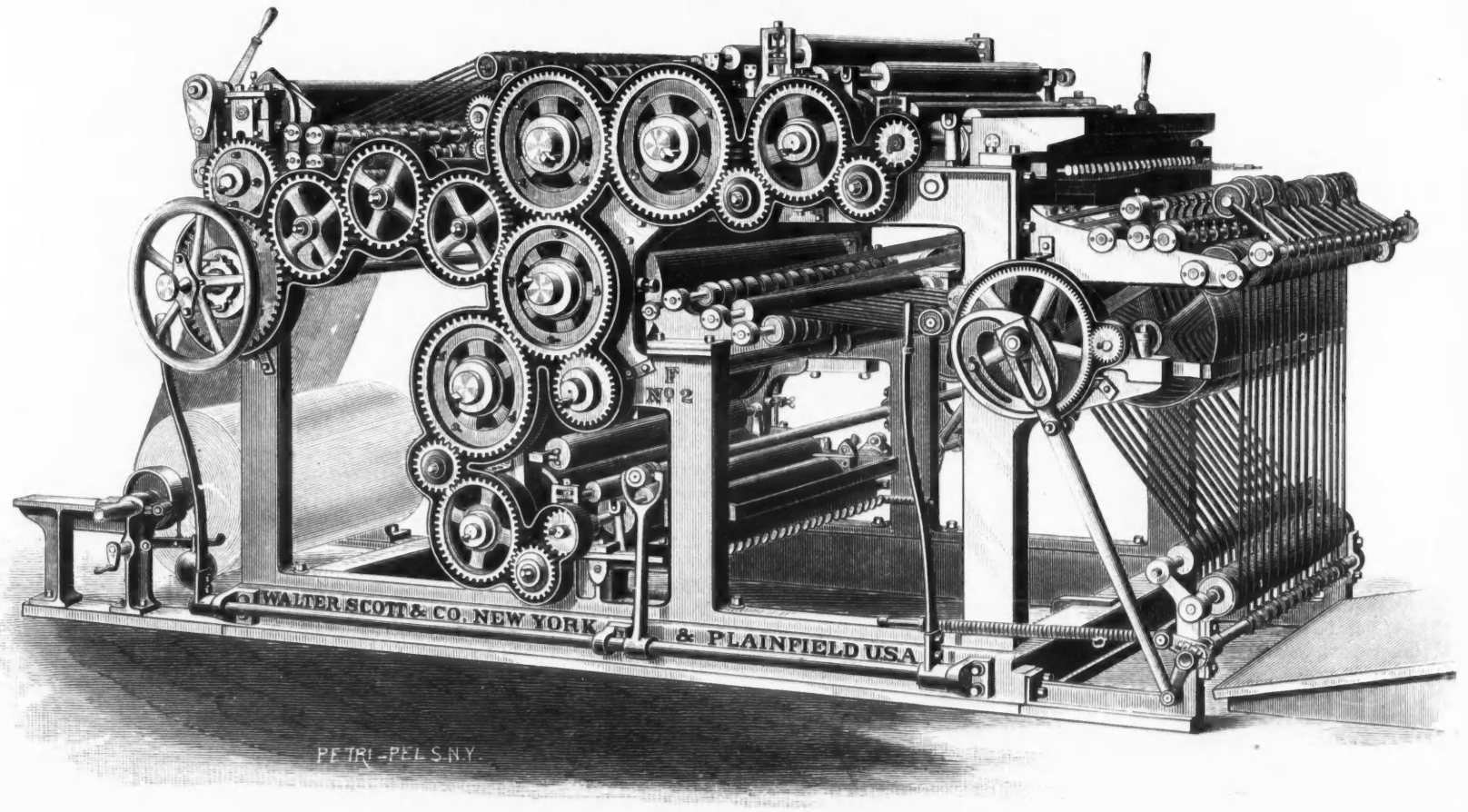


SCOTT'S PLATE WEB PRINTING AND FOLDING MACHINE.



SCOTT'S BOOK WEB PRINTING AND FOLDING MACHINE.

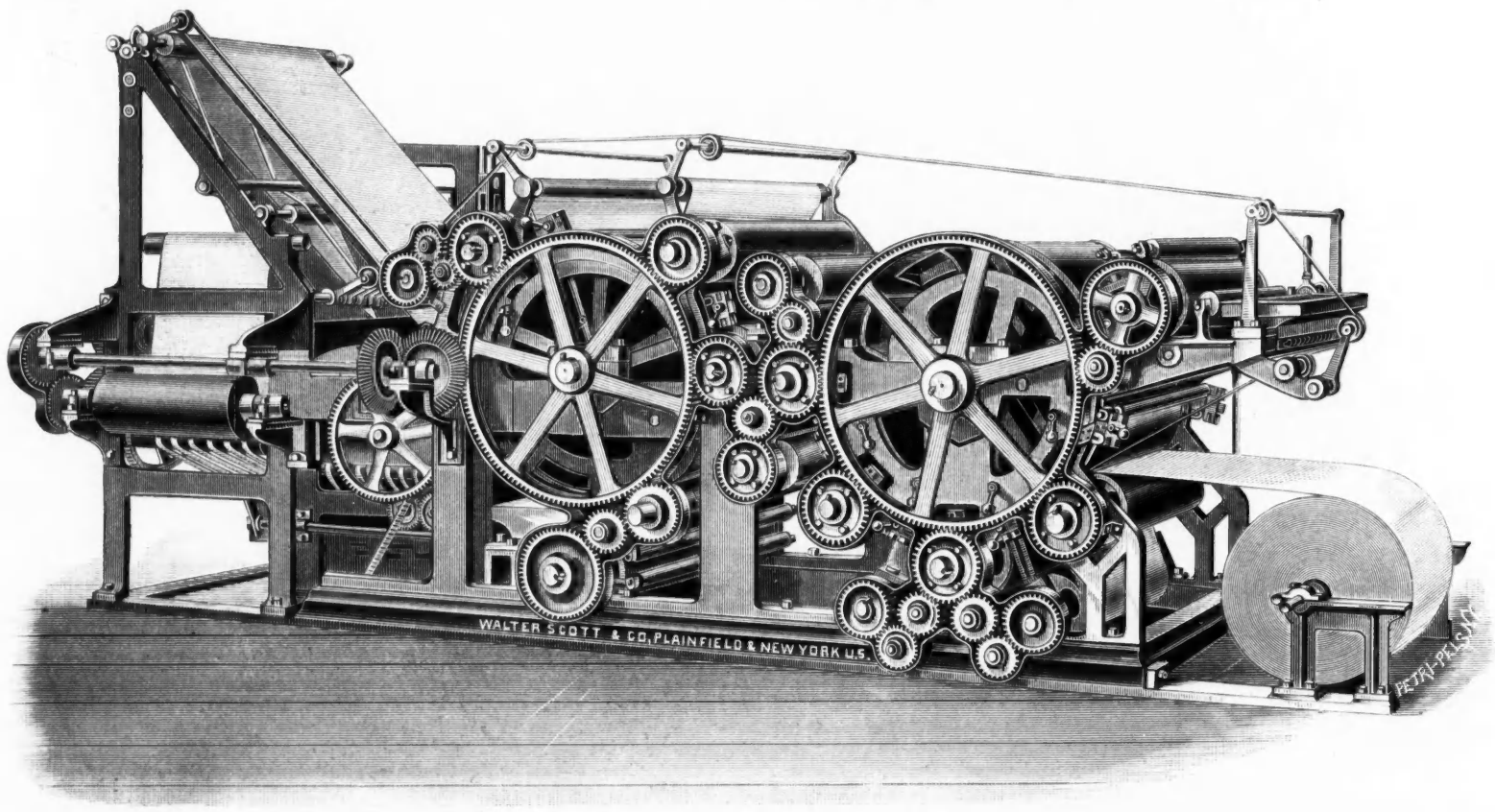
New Printing Machines.

We illustrate on this page and on page 2, three printing presses manufactured by Walter Scott & Co., Plainfield, N. J.

The plate web press is a roll-feed printing and folding machine. It is designed to print from stereotype plates. The cylinders are arranged so as to make a very compact machine, and also very convenient to manage. The inking apparatus is greatly improved. The folding is also very compact. The web passes through the machine in a manner similar to all web presses. When printed it is cut by the cutting cylinders, and each alternate pair of half sheets are switched to two folders; when the first half sheet reaches the gauge on folder it is slightly raised up on its rear end by a set of lifting fingers, and the following half sheet is run in underneath the first. The two halves are then folded together, forming a full sheet cut on the ends, and pasted when desired. After the first fold is made on the upper set of folders, it passes down to the lower set, and is then completed at the same time with the sheet from the lower folder.

This machine prints and folds 12,000 to 15,000 per hour of 8-page papers with a single set of plates, and 24,000 to 30,000 of 4-page papers, and of course twice that number with a double set of plates.

The type web machine prints and folds direct from the type. With evening newspapers, where time in going to press is an object, and on papers of small circulation, where the expense of stereotyping is too great, it is desirable to print direct from the type. The type is securely fastened on the cylinders by means of "turtles." There are two large cylinders; one-fourth of their surfaces is covered with type, the remaining three-fourths being ink-distributing surfaces. The type to print one side of the paper is placed on one cylinder, and for the other side on the opposite cylinder. In contact with each of these cylinders are placed four impression cylinders, so that at each revolution of the large cylinder four sheets are printed. In order to present a continuous sheet at the proper time and place on these cylinders, there is placed between each impression cylinder a take-up cylinder so arranged as to take up one length of sheet to be printed plus the distance between the impression cylinders. The sheet being printed on one side passes to the second set of printing cylinders and there receives the impressions on the other side; it then passes to the cutting and folding apparatus, when it is severed into sheets and folded into convenient size. The sheets can be delivered flat or run into a folding machine and folded at the same operation.



Scott's Type Web Printing and Folding Machine.

This machine will print and fold at a speed of 12,000 to 15,000 per hour.

The book web machine is roll-feed, designed to print books, almanacs, etc. The cylinders are arranged to facilitate the working of the machine, putting on plates, overlays, etc. The inking apparatus is more extensive than hitherto generally used on such machines, as a much finer quality of work is to be done. A very marked improvement is that of the sheet cutting arrangement, enabling this machine to print and deliver almost any size sheet (within the range of the machine) in length and in width, according to the width of roll of paper. One machine now in use can cut off about 38 different lengths of sheet from tissue paper to cardboard. The only change necessary to accomplish this is a simple adjustment, which can be done in less than five minutes.

The web of paper is fed to the machine between rollers at a speed equal to the length of the sheet required during each revolution of the printing cylinders. The cutting cylinders are driven by eccentric gearing, and revolve once to each revolution of the printing cylinders. The eccentric gears are adjusted so that the cylinders are running at or near the speed of the web while the knife is in the act of cutting off the sheet. The moment the sheet is cut off it moves at the same speed as the printing cylinders.

"Am I My Brother's Keeper?"

We have received a pamphlet entitled "Profit Sharing, by N. O. Nelson, St. Louis, Mo." Mr. Nelson is a large employer of St. Louis, and he has been putting in operation for the past year the plan of profit sharing, with, apparently, excellent success. We do not see how we can better do justice to Mr. Nelson's views than to quote a paper read by him before the Unitarian Club, of St. Louis, with the title which we have placed at the head of this article. We give it complete:

From the dawn of tradition to the present moment selfishness has propounded this challenge to the nobler instincts of mankind. Neither the brand of Cain nor the golden rule has effected the regeneration of that animal instinct of our natures by which the strong destroy the weak. The gentle persuasions of religion, the stern logic of philosophy, have done much to modify, but they have been unable to eradicate the spirit of Cain.

Upon whatever essentials of creed Unitarians may dissent from their orthodox brothers, this at least they hold in common with every religious faith, the brotherhood of man and the reproach of selfishness. This ethical question lies at the root of all religion, all friendship, all patriotism. Upon the answer to this question depends the happiness and progress of mankind. There was a time in our young history when the fashioning of our political system was the burning question. Hamilton believed in the supremacy of intellect, Jefferson in that of men. Hamilton believed that the few only could attain that culture which qualified a ruler. Jefferson believed the responsibilities, as well as the rights, of citizenship, were the means by which all classes of men would become equally intelligent and virtuous.

Later on, slavery came to be the issue between vested rights and human rights. The most conspicuous enemies of this property right were the fathers of Unitarianism.

Channing and Parker refused to be blinded by the plea of the divine right of constitutional property in human beings.

They believed in the dignity, not the depravity of man, and no law could make it right to degrade the weak and helpless in order to pamper the strong. Neither constitutional law nor accepted custom could rob any human being of the rights the Creator had planted in his nature. In each of these issues the rights of man prevailed.

By slow steps, through blood and suffering, repeating the history of civilization, privilege and injustice gave way to enlightenment and conscience.

To-day we have before us another issue, equal in import and intensity to any which has gone before.

All the rights secured by the great charter, all the guaranties of our constitution remain to us. But from the feudal system of privilege on one side and serfdom on the other, we have emerged into an industrial system which is wholly different in kind, but which differs but little in degree.

Any man may promote himself from the proletariat to the aristocracy, but there is nevertheless a small body of masters and a great body of dependents. The mass of our people live upon daily wages regulated by supply and demand. When there are a million men out of work wages cannot remain higher than the lowest upon which the laborer's family can subsist. Capital is generaled and entrenched. It possesses the machinery of government, the machinery of production and supplies to withstand a siege. Separately and unorganized the wage workers are as dependent as either the serf or the slave.

Organization and concert is his only measure of defense, strikes his only weapon. But with a multitude of hungry men with idle hands ready to catch at any opportunity, this remedy is futile unless he can prevent these from filling his place. By inexorable logic we arrive at the state of industrial war, which has become so familiar as to scarcely excite notice. Viewed from either combatant's premises the attitude is disastrous and threatening.

Fourteen thousand men out in Chicago, was the announcement in last Sunday morning's papers. Eight hundred men quit work yesterday in a Pennsylvania coal mine. The chief of a detective agency informed me Saturday that he had just returned from St. Paul, where all traffic had been closed by a general railroad strike. He had gathered his armed forces from every part of the Union and marched upon the strikers in regular military platoons. Week after week similar reports reach us. These disturbances are a regular feature of the news department, headed "Labor Lore." I need not allude to the shame we feel as Americans that our beloved and beautiful land, our free institutions, our Christian civilization, stand charged with these social crimes. He who faces a threatening disaster without exerting himself to avert it, or he who regards himself only when danger surrounds his kindred, is lacking in the essentials of manhood.

We, as Unitarians, without a priesthood to command or a creed to prescribe our movements, stand bound by the individualism of our faith to act our part upon our own judgment. We are distinctly our brother's keeper. Man is indeed our brother, the world our country.

Believing that no man can justly take to himself all that selfishness and power and cunning can bring within his control, and believing likewise that the gravest wrongs may be done under the forms of law, I regard no Unitarian's whole obligation discharged until he has put his heart into sympathy with his brother man. Where ignorance and injustice and distress is the deepest, there is his sternest responsibility.

With a land so bountiful in natural resources that many times our present population could subsist in comfort, we are yet puzzled and often horror-stricken at the growing number of the unemployed, the squalor of the larger number of our families and the ignorance and recklessness resulting from these conditions.

It will not do to answer that these conditions have been worse in the past, that we are gradually advancing. Be this true, it would only prove to us that improvement is possible. The evils are admitted, but the possibility of remedy is doubted.

Laissez faire has done its work. We have let alone until it will answer no longer. The issue is before us in such living colors that the blindest may see it.

The recent vote in New York, in Milwaukee, and here in St. Louis, gives warning that the working people have accepted the advice so often given them, to appeal to the ballot, and not to violence. In a perfectly legal way they propose to remedy their wrongs. But social abuses can be reached only indirectly by legislation. It is a perfectly legitimate resource, but it is beset with grave difficulties and dangers.

Men galled by injury are not the wisest or most moderate leaders.

If thoughtful men who by ability, virtue, or accident, stand in the position of social leadership, should give to this subject the candid and unprejudiced consideration which is due to its political and its ethical importance, it may be that plans can be adopted for so far modifying the severities of the wage system that agrarian legislation will become unnecessary.

If we rid ourselves of the narrow bigotry

which decries all reform, and at the present juncture attempts to silence opposition by first misrepresenting and then denouncing it, we shall be on the road to peaceful improvement.

If we bring ourselves to criticise dispassionately the system of arbitrary wages, we find it crude and cumbersome and productive of strife. When all commercial influences combine to make prosperous times then there is work for all. Wages which are relatively high are paid, and yet surplus, termed profit, is accumulated so rapidly that directly we suffer collapse from that dreadful misnomer, over-production. By the very statement of the case it is clear that while the wages paid were higher than in times of depression, they were much lower when compared with profits. This arbitrary system thus cuts both ways.

The surplus piled up so rapidly is like a flooded water wheel—it stops to a large extent the entire productive machinery.

On the one hand a million of men out of work and several millions of women and children out of bread and decency; on the other, failures doubled and capital shrinking. And all this time, in prosperity and in adversity, strikes and ill will, and sometimes violence.

The system is wrong.

The theory of all civilized nations is co-operation, and yet my first mention of the word, I dare say, will bring to most minds the idea of communism. We have co-operation in a thousand ways, and yet co-operation in the conduct of private business is regarded with us as the idle, if not revolutionary phantasy of French Proudhons and English cotton weavers. But while correct in principle, productive co-operation has its serious difficulties in practice. Given the same conditions one man fails and another succeeds. Particular qualities are required for leadership. Such leaders are almost universally drawn from the rank and file by a process of natural selection. Combined with capital they become the natural heads of productive enterprise. A body of workmen in undertaking simple co-operation have neither capital nor leader. They are at a serious disadvantage.

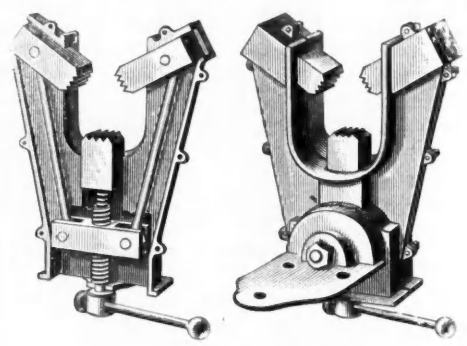
Largely in France, and to some extent in England and the United States, the profit-sharing plan has been adopted. It is in the strictest sense an evolution from the established system of flat wages. Any firm or corporation may inaugurate this method without deranging its internal economy. The business is conducted in the usual manner, customary salaries and wages being paid. If profits are earned, a division is based upon the capital employed and the wages paid. The ratio of division may vary according to the nature of the occupation or the disposition of the proprietor. It may be a cash dividend or a stock dividend. A reasonable arrangement may be as follows: Out of net profits pay capital market rate of interest. Workmen would gladly become proprietors, could they hire capital. In this arrangement not only is the capital supplied, but likewise an established business coupled with expert management. Set aside a sufficient guaranty fund for possible future losses, and as disability and death leave helpless families in destitution, credit a fixed portion to a provident fund. The former insures capital, the latter, men. Provision is thus far made for a proper accretion to productive capital, and at the same time for keeping it and the workers in repair. What now remains is a clear surplus and may safely be consumed. Shall it be hoarded to eventually force out of activity both labor and capital, or shall it be divided among those who have by brain and skill and patience produced it? Shall the mothers and children have better houses and better clothing, more churches and better education, less squalor and less dependence on charity? Justice might well dictate that all of this surplus should go to those who had made it. But let us not attempt too much at once. Divide it equally upon capital and wages combined.

If the former be two-fifths, let it receive two-fifths of the net profit remaining after the deductions enumerated have been made. A man earning $1,000 per annum would get twice as much as the one earning $500, and four times as much as the apprentice earning $5 a week. The process is automatic. The rate of salaries and wages is regulated as under the present system, presumably according to efficiency. The division of profits adheres to the same scale.

If the business stand in need of additional capital, or if the proprietor designs to gradually retire his investment, the dividends may be partly or altogether paid in certificates of one nature or another.

Greater efficiency and less liability to disputes is assured, for each holds a contingent interest in mutual good faith.

The charge has been made that the present conflict was not between capital and labor, but between work and idleness. Will any man credit this statement who has seen every furnace in Carondelet blown out and half the factories of the entire land closed?



Challenge Pipe Vise.

Will any large employer say this who is constantly beset with applicants, not for charity, but for hard work?

Is there ever a strike that the vacant places cannot be filled by many times the number required? What a mockery to call that man a tramp who cannot in all this lavish land find a day's work. Like Tantalus, doomed to thirst in the midst of the sea, the man out of work sees all about him abundance going to waste.

We are told that the strikes and the election of labor candidates must be met. Met by what? By force and carnage, or by reason and justice? Can a man lay claim to morality, much less to Christian humility, who answers his brother's despair and his sister's degradation with the brutal words of Cain?

The "noblesse oblige" of the French, the golden rule of all religions, and the red brand of infamy which has clung to the name of Cain, all alike declare that we are not for ourselves alone, we are "our brother's keeper."

Captain James B. Eads.

The death of Captain Eads removes another of the great self-made engineers whose works have done credit to the country, and whose examples are even more valuable than their works. From peddling apples in the streets of St. Louis—Captain Eads' early vocation—up to clerk on a river steamboat, and so on to the accomplished engineer, looked upon by what must be done on the way without other than self-help seems a long distance. His success was not phenomenal, there was nothing of the mysterious about it; but it was remarkable.

Captain Eads first became generally known through the services he rendered the Government during the late war. His knowledge of the Mississippi river was at that time probably greater than that of any engineer in the country. The Government had pressing need of a large number of light draft gunboats for use on the Mississippi and its tributaries. These were constructed by Captain Eads, with such facilities as he could find and improvise, and with a rapidity that was astonishing; and they proved to be well adapted to the service for which they were intended.

Later he built the bridge across the Mississippi at St. Louis, universally considered a great engineering work very successfully done.

He was, however, better known through his work in deepening the mouth of the Mississippi river, below New Orleans. In his plan for doing this he was opposed by a majority of the best known engineers in the country, but he carried this to a successful issue, and just as he expected to do. No man needs a better monument than this; it has already been of incalculable value to an important section of the country.

Every ambitious young man may benefit by the success of such a man, but mistakes are likely to be made in the application. One mistake is to look upon his success as being achieved by an uneducated man. Captain Eads was an educated man, though he did not get his education from colleges; he worked it out himself, but it was no less complete and to the purpose. Whether better earlier educational advantages would have been a benefit to him, or otherwise, is a question that cannot be answered. The most we do know is that he succeeded beyond more than a few others, without these advantages.

Another thing too often assumed is that such a man succeeds through some other means—undefined and indefinite—than hard persistent effort; good, honest hard work with a fixed purpose in view. It was exactly this kind of work in the way of self-education and in carrying out his plans that made Captain Eads a great engineer. What he possessed that many others do not, was a fixed purpose to succeed, backed by untiring industry.

Norfolk Southern Railroad.

PERFORMANCE OF LOCOMOTIVES.

JANUARY, 1887.

Mileage.

Passenger	3,480
Freight	7,530
Mixed	
Work	
Switching	2,907
Total	13,917

Cost per Mile in Cents.

Repairs	1.05
Wages	3.86
Fuel	4.84
Oil and waste	0.31
Total	10.06
Cost of coal	$2.60
Miles run to ton coal	53.68
Miles run to pint oil	15.08
Average number passenger cars per train	$3\frac{1}{12}$
Average number freight cars per train	$20\frac{2}{3}$
Five empty freight cars = 3 loaded...	
Number of engines	8
Number of serviceable engines	6
Average miles per serviceable engine	2,213
Miles of road	74

J. S. Whitworth, M. M.,
N. S. R. R., Berkley, Va.

We should be glad to have cards showing locomotive performance from any master mechanic who will favor us with them.

Train Signaling Apparatus.

All the passenger trains on the Pennsylvania Railroad and on several other lines are now equipped with a train signaling apparatus in which a whistle is used in place of a gong. This arrangement has been perfected by the Westinghouse Air Brake Company, and can be easily applied to trains on which this air brake is used. To the main reservoir—which supplies the brakes with air—is fastened a reducing valve, and to this valve the main signaling pipe is connected. This pipe runs through the whole length of the train, and between the cars it consists of hose and couplings. At one end of each car the main signaling pipe extends upwards and connects to a small valve fastened to the car directly under the hood. From the end of the handle of this valve a cord is run along the inside of the car, in the position usually occupied by the bell cord; this cord is not connected between the cars. On the engine a signaling reservoir is placed, having to one of its ends a signaling valve attached. The main signaling pipe leads into this valve; and another pipe connects this valve, and a small whistle placed in any convenient position in the cab of the engine. This signaling valve has a diaphragm which divides it into two chambers, the lower chamber being in communication with the signaling reservoir, and the upper chamber with the main pipe. This diaphragm is so arranged that it allows air to pass freely from the main pipe to the signaling reservoir, so that an equal pressure is maintained in both. The air from the main reservoir is taken through the reducing valve, which is so constructed that, notwithstanding the great variation of the pressure in the main reservoir, the air is admitted into the main signaling pipe throughout the train, the signaling reservoir and its valve, and maintained in the same at a constant moderate pressure of about fifteen pounds per square inch. When it is desired to give a signal, the car valve is opened by pulling the cord; by doing so the pressure in the main pipe is reduced below that in the signaling reservoir. This inequality of pressure acts on the diaphragm in the signaling valve, which will then permit a portion of the air in the reservoir to escape to the whistle, and give a signal to the engineer.

It is claimed that signals can be given at the rate of four or five per second with great certainty. Also, if the train should break in two, the whistle will blow loudly for a considerable time. This apparatus has been used on the Pennsylvania Railroad for some time with great success.

The Challenge Pipe Vise.

This is an open top vise without hinge or lock, arranged to be fastened in any position to the top, bottom or side of anything strong enough to hold it. The bench plate being fastened, the mouth of the vise can be swung to sixteen different angles, and held immovably in any of those positions. The open top permits any crooked pipe, or one having fittings on it, to be dropped into the jaws, and gripped. The jaws are simultaneously moved in or out by means of a steel screw and connecting rods, arranged to give great gripping power. In removing the pipe from the jaws it is only necessary to loosen the jaws, when the pipe can be lifted directly out.

All parts are made interchangeable, and duplicate parts can at any time be furnished by number. The manufacturers are Elger & Elger, 49 Broadway, New York.

Heating appliances which burn coal economically and are gas proof are in the market, but when these are attached to houses without ventilation a failure in healthful heating will be the result. The safest and best way of obtaining healthful heating is to employ an architect who has studied and mastered the subject of ventilation.

One of the latest devices for a pulverizing machine is to create an artificial cyclone in a closed vessel. It is claimed that in this way any substance whatever can be reduced, very economically, to an impalpable powder. They do this thing out West naturally, and some observation leads to the belief that the work is done well enough.

In the District of Columbia, persons who wish to take charge of boilers or other devices subject to steam pressure, will have to be examined and licensed before they can fill these positions.

A fly-wheel in a rolling mill in Belgium recently burst, demolishing a second fly-wheel, wrecking the iron roof of the building, killing three men and injuring 35 more.

Jigs and their Construction.

By C. E. Simonds.

In the construction of jigs, surfaces should be planed true and square with one another for the purpose of laying out the required distances for bushings, bearing points, and other minor details. The planing of such surfaces greatly assists in their being fastened to the face plate of the lathe or platen of the drill press.

In the construction of jigs for drilling purposes, to produce a jig which shall drill or ream the holes accurate, the greatest care must be taken in laying out the required distances for the holes in which the bushings are to fit. Where lines are to be made for the purpose of locating the different holes the surfaces should be covered with a solution of copper dissolved in nitric acid and applied lightly with a clean piece of waste. The application of this solution to a finished surface produces a copper like surface on steel, wrought and cast-iron, and by its use fine lines can be made in any direction with the grain, and in an opposite direction.

In the construction of jigs wherein accuracy of measurements are an essential feature, the vernier or an improved Brown & Sharpe graduated scale, from which inches and thousandths of inches can readily be taken off with the points of the dividers and transferred to the surface of the jig, should be used. The workman when about to test the accuracy of the distances bored must resort to his verniers. In measuring to find out if the distances are correct a plug is fitted into each hole bored, which should be of standard size, then with the verniers measure the outside of each plug while in the hole, and make a note of what the reading is, then ascertain the diameter of the plugs; if the plugs are of the same diameter the size of one must be subtracted from the total amount, to give the distance between the centers of the holes. It is not always the case that verniers are to be had; if such is the case and the distance is not great, a fine-pointed pair of dividers can be used. The plugs which are fitted in the holes are first turned in the chuck from a piece of stock without centers. After the piece is turned to the right size make a fine center point in the piece, with a fine pointed centering tool. The bottom of this center hole should be shaped so that the fine and sharp points of the dividers will always locate themselves exactly central with the center of the plugs. After the fine point has been made the center indicator can be applied to ascertain if the hole thus made runs true; if found out of truth the center should be scraped with the centering tool until the indicator rod ceases to vibrate. When making one or more plugs in the chuck it is well to turn one at a time, because in cutting off the plug possibly the remaining part would be sprung out of truth by the tool catching. In the class of work under consideration all chances of making errors should be guarded against; they will come fast enough, however cautious we may be. When fitting the plugs, have them turn in by the fingers, and fit tight enough to stay in any position.

When the jig is to be fitted with feet or bearing points these should always be placed in position before the holes for the bushings are made. It is a good plan, when making these bearing points, to provide them with shoulders, so that when once in place they cannot be changed from their original position. Have the part which enters the jig of good length, so as to give stability, and when fitting them in, always drive them to a shoulder. Whenever conditions will admit, always provide means so that in case it is required the legs or bearing points can be removed. Have the part remaining outside as short as possible, and with good bearing surface, with corners slightly rounded, this will prevent scratching the drilling table and gives a better appearance. When hardening let it extend to a slight depth, not over one-eighth of an inch; this will prevent the surfaces from wearing to any extent. Always have the bearing points ground parallel and true with the surface planed for this purpose.

When these bearing points are in place, driven into a shoulder and ground true, the jig is ready to have the holes for the bushings made. The advantages of having the legs or bearing points driven into a shoulder before it is strapped to the face-plate are apparent, for if the legs or bearing points are put in without a shoulder, when the jig is bolted to the face-plate of the lathe there is no knowing whether they would be disturbed or their true position changed.

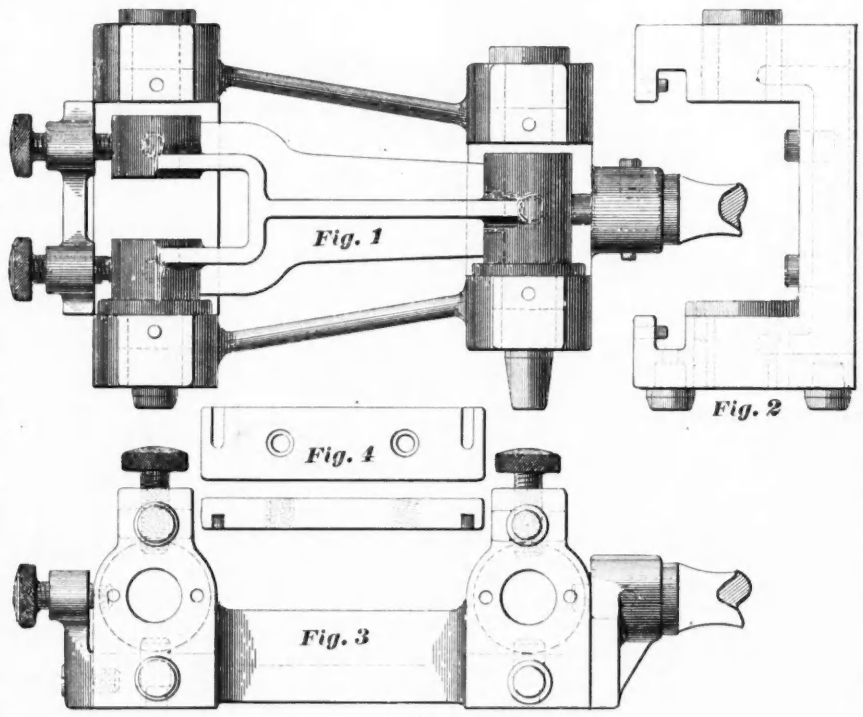
There are conditions where the holes for the bushings cannot be made in the lathe, owing to the size of the jig and swing of the lathe. In this case the jig should be constructed from a model piece belonging to the machine.

Suppose that the jig can be fastened to the face-plate and revolved in the lathe for the purpose of boring the holes for the bushings. As the proper location of the centers for the bushings have been made, and located in different directions, it sometimes happens, owing to the construction of the jig, that the bearing points or feet of the jig, as it is moved over the face-plate for boring the holes, that, owing to the great number of holes or slots in the face-plate, it is found inconvenient to use the face-plate. In this case temporary pieces of cast-iron, large enough to admit of holding the jig, should be fastened to the face-plate; the side bolting against the face-plate should be planed, and the side to receive the jig should be faced off while the lathe is revolving. After the jig has been lightly bolted on, bring the dead center as close as possible to the center made in the jig for the bushing, using care so as not to allow the dead center to touch the center in the jig; if it should and they not be in line, the value and distance of one center with the other in the jig is destroyed. The only object in bringing the dead center to the center made in the jig for the bushing is to locate it somewhere near the true position, so as to save so much adjusting. When the location is somewhere near the dead center apply the fine point of rod in the center indicator, and true up the piece dead true.

For every hole in the jig designed for bushings the indicator should be applied until the rod ceases to vibrate. In laying out the different holes to be drilled the greatest caution should be exercised; do not feel satisfied after they are all located, but examine them over again; it will pay to do so; some mistake may have occurred.

This method is a tedious one, still it at times saves making special tools which are required when the jig is made from the model.

The drawings accompanying this article represent what is termed an open-faced jig, the reverse of a box jig, inasmuch as this work is in an exposed position, Figs. 1, 2, 3 and 4 showing the different views, the model piece being shown in position in Fig. 1.



Jigs.

Loss of Heat from Uncovered Steam Pipes.

We take the following from the *Locomotive*, published by the Hartford Boiler Insurance Company. The subject is one of importance in that everybody using steam is interested in preventing loss by radiation as well as in knowing the extent of that loss:

"A very practical test, to ascertain the loss of heat from uncovered steam pipes and those covered with different coverings, was conducted by Messrs. L. A. Upson, Superintendent, and Chief Engineer Steele of the Hartford Carpet Company, with the following result:

"A room having a very even temperature and free from draughts or air currents was selected, close to the boilers, where steam could be taken from the top of the main pipe, and free from water of condensation. A suitable vessel was arranged to collect the water of condensation, and connected to 120 running feet of two-inch steam pipe. A short section of the pipe was inclosed in a suitable box with a glass in the side for the purpose of reading the rise of temperature, as indicated by a thermometer placed therein.

"Steam was first blown through the pipe and receiver until both were free from the water of condensation which was caused by heating the pipe and receiver. The valve was then closed, and ten-hour trials made, the water carefully collected and weighed, with the following results:

First Trial.—Ten hours, 120 feet of two-inch pipe, uncovered.

Average steam pressure,	79 pounds.
Average temperature of room,	70 degrees.
Average temperature of box,	167 degrees.
Pounds of water condensed,	862.

Second Trial.—Ten hours, 120 feet of two-inch pipe, covered with asbestos, hair felt and paper.

Average steam pressure,	77 pounds.
Average temperature of room,	69 degrees.
Average temperature of box,	80 degrees.
Pounds of water condensed,	222.

Third Trial.—Ten hours, 120 feet of two-inch pipe covered with plastic material.

Average steam pressure,	80 pounds.
Average temperature of room,	70 degrees.
Average temperature of box,	107 degrees.
Pounds of water condensed,	480.

"It will be seen from the above that the loss by radiation greatly exceeds that usually estimated for uncovered pipes, but it agrees very well with trials made upon machines carrying high steam pressures. The saving by covering the pipes is very satisfactory, and in the second trial the temperature in the inclosed box was but little higher than that of the room."

The Aristocracy of the Footboard.

By John A. Hill.

I noticed in a recent issue of the *Scientific American* a clipping from some paper and the writer's comments on it that were interesting and amusing at the same time. The clipping was something like this:

"The fact that two competent men are on the footboard of a locomotive, both noting the condition of the water, is the probable reason of so few accidents from this cause on the thousands of locomotives running in this country."

The writer then goes on to show how little the fireman knows of the condition of the water, how a slotted tube is often placed over the water glass, slot toward engineer, etc., and how engineers will brook no interference or inquiry from the fireman in this and other matters, and cites an instance where a "fresh" fireman was knocked silly with a soft hammer for trying a guage cock and making some remark about low water. Now some of this is good and some is bad; no road should allow the slot racket. A thin metal shield should protect the front of glass from coal chips and the men from hot water in case of a broken glass. There is a grave responsibility resting upon the engineer of any locomotive, and there should be a proportionate diginity and self-respect accompanying that responsibility, but I am—as a working engineer—opposed to an aristocracy or a "great I am" dynasty on my engine—or rather on the one I run, she belonging to the company. In the first place, most successful engineers were once firemen, and the fact that many of them have forgotten that fact breeds the class of men who knock down firemen for being inquisitive about water and other little matters of interest on the engine, but somehow I remember distinctly about picking wood slivers out of my hands, and the first running I did—from the fire door to the back of the tank—and I still smell sperm and acid and "dope," and remember the oil and emery, and the stack paint, and the flue-auger, and the frozen ash pan, and the cross engineer, and the oil house that was half a mile from the round house, and a few of those little flowers that are strewn along a fireman's pathway, and there is very little aristocracy business between the young man who runs the scoop on the kettle I start and stop, and myself. A good fireman is the most important factor to an engineer's success. A man who attends to his part of the business first, last and all the time, is a comfort and a luxury to any engineer, and, for my part, is highly appreciated. A man who keeps her there (100 and enough) must be a live, sensible, energetic, ambitious man. To have these qualifications and be content to be a fireman always are utter impossibilities. So the good fireman is anxious to learn, water and all, and has a right to be inquisitive. I do not want a fireman to try the water while I am sitting on the side and attending to business, but I should not knock him down if he did, especially if he were larger than myself, but if I were temporarily off the engine, doing something else, on a siding, at a wreck, or any other place, I should not only fail to get angry, but would be glad to know that I had a man on there who would not let anything happen in the water line if I forgot or neglected it.

I feel the same about train orders and time card meeting points. In the six years I have been running I have had many firemen; some good, some bad and some "just middling," and when I find that the "new man" is a good one I commence to court him. When the run is hard, and the fireman very busy, I find time to get a drink without having it handed to me; I can find time to go back and see how much water I have myself before I run by a tank, and throw down a few lumps of coal and crack them on the way, and fill an oil-can once in a while without much kicking; read my orders and give them to him to read; and if he asks me "Where can you make for No. 7?" I do not tell him to "run the scoop and I will run the engine." A

thoughtful, careful fireman has saved more than one engineer from making a bad break, and the boy who wants to learn and talks of train orders, trains due, and notices the hot pin on his side, is the future engineer, and is worth a dozen numskulls, who know and care just enough to be happy when the pop is up and shovel coal when it is down. The swell-headedness of some men would go down considerably if they would remember back a little and think how poor firemen they were themselves. On the other hand, the fireman who aspires to be other than a stoker all his life should remember that men are not, as a usual thing, promoted because they are good engineers, but good firemen, men who attend to their work, who did not hold many trains on account of being late in getting around, who were not noted for being drunk every pay day; who spent much of their leisure time about the shops trying to learn what they could of the locomotive rather than "up on the row;" who read the American Machinist in place of the *Police Gazette*, and the daily papers in place of dime novels.

This is an age of progress, especially in railroading, and the fireman must keep abreast of the times—and so must the engineer for that matter. The next generation of engineers must not believe that pumps are better than injectors, and that the latter is a "vacuum sucker," and that hand-brakes are better than Westinghouse automatic, and the latter a great job of mechanical gloom. It is not necessary for a man to know all about the repairs of a locomotive, but the more he knows the better engineer he will be. But I started in about the man with the soft hammer and of the runners I know who would be soft-hammer men. The most of them think it a great recommendation to be able to hear it said that they are better engineers drunk than some other man is sober. It is not my purpose to find fault with all the affairs of the road without offering a remedy, or what I think a remedy. In this case all the trouble comes from the men promoted or aspiring to promotion, and in my next epistle to the car hands I shall offer my plan of hiring and promoting engineers and firemen.

In the extreme southwest corner of Louisiana lies what is claimed to be the largest producing farm in the world. It contains 1,500,000 acres of land, and is operated by a syndicate of Northern capitalists. All the cultivating, ditching, etc., is done by steam power. The Southern Pacific Railroad runs for thirty-six miles through the farm. Three steamboats are running on the waters of the same estate, also an ice house, bank, ship yard and rice mill belong to the same.

The Davis Regulating and Reducing Valve.

Fig. 1 represents this valve in perspective, and Fig. 2 is an enlarged section. Referring to the latter, *A* is a double-seated balanced valve, adapted to move through the circular seats *B*. The piston *D* is three and one-half diameters in length, grooved for water packing. The link *C* and stud *I* connect the valve with the piston, causing them to move in unison.

The duty of stem *E* is to establish communication between piston *D* and yoke *F*, causing the weight hung upon the lever, as shown in Fig. 1 to be felt upon piston *D*, through the medium of connecting rods *J* and yoke *F*. The cover *L* closes the top of cylinder in which piston *D* works, and also guides stem *E*, which passes freely through the cover.

Pipe *P* drains water, the result of condensation, which may accumulate above piston *D*. It is found in practice that very little water passes this pipe.

The operation of the regulator is as follows: Connection is made with inlet end *N* in direct communication with boiler or other source from which fluid is drawn. The steam or other fluid passes from high pressure chamber *N*, through valve *A* into low pressure chamber *O*, and bottom of cylinder below *D*, until pressure under piston *D* is equal to the weight brought to bear upon the piston, through the medium of stem *E*, yoke *F*, rods *J*, and lever *K*, when the piston *D* will ascend, carrying with it valve *A*, and causing it to approach its seats, and diminish the supply, causing reduction of pressure in chamber *O*, and under piston *D*, which reduction of pressure will allow piston *D* and valve *A* to descend, giving greater opening through valve *A*. In regular operation the position of valve *A* is constant, gradually opening or closing, to supply the required volume to maintain the pressure in chamber *O*, and not intermittent in its operation.

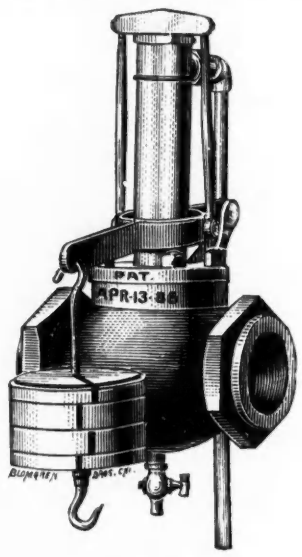


Fig. 1.

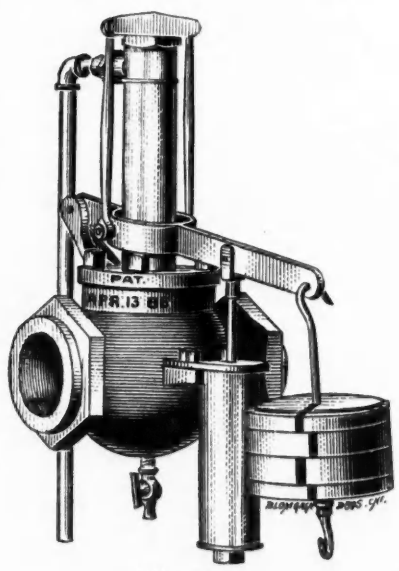
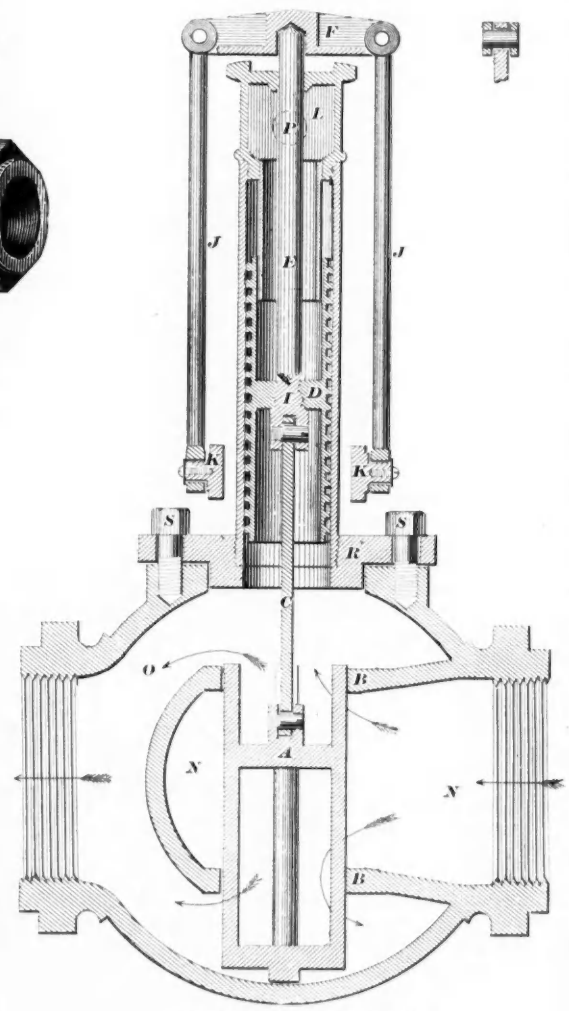


Fig. 3.



Reducing Valve.—Fig. 2.

It will be observed that the principle is simply a balancing of weights and pressure, and the slightest reduction or increase in pressure under piston *D* will cause the valve to close or open. It will be observed that piston *D* rests upon and is supported by pressure to the extent of its weighting, and gives the required opening to pass the required volume to maintain the pressure in chamber *O* and under piston *D* as the fluid passes to its work.

The valve may be readily taken apart by unscrewing cover *L* of cylinder, removing screws *S* and cover *R* and disconnecting link *C* at the bottom.

The joints are all ground, no fibrous packing being used. These valves are made in sizes from 1 to 8 inches.

The valve shown in Fig. 3 is the same in all particulars as Fig. 1, with the addition of an oil cylinder or dash pot, which is attached to side of regulator. This cylinder contains a piston, the rod of which is connected with lever *K*. The cylinder is filled with oil which finds passage past the piston as it may raise or fall (piston being fitted a little loose).

The object of this cylinder is to prevent jumping or chattering—a common thing with regulators. This valve may be used on the steam pipe, to a pump, or under loaded engines, or wherever it is desirable to work with a lower steam pressure than that carried on the boiler.

These valves are manufactured by G. M. Davis & Co., 20 South Canal street, Chicago, Ill.

The *Fireman's Journal* says:

"An English journal says the American locomotive of to-day is one of the most perfect pieces of mechanism wrought out by the hand and mind of man. Can the same be said of our steam fire engines?"

Why don't the *Journal* tell builders what the faults of their engines are?

The steamship Great Eastern, which is now lying at Dublin, is to proceed to Glasgow, where she will be taken in hand by Messrs. John Elder & Co., and entirely refitted. Her paddle wheels are to be removed, and new triple-expansion engines put in. When finished, it is expected that she will attain a speed of twenty knots, and is to be used in the Australian trade.

It is estimated that at the end of 1883 the total number of locomotives actually at work in the principal countries of the world was about 86,941. Of these the United States employed 28,587; England, 12,482; Scotland, 1,713; Ireland, 632; Germany, 11,205; France, 8,088; Russia, 5,844; Italy, 1,913; Spain, 1,860; Switzerland, 619; India, 2,525; Canada, 1,481; Mexico, Brazil, etc., 2,250. The remainder were employed in smaller countries.

The price of some of the largest locomotives used on the English railways is at present about £2,000 each; but it is very doubtful if prominent English builders will build engines of the same class for foreign countries at anything like that figure.

Locomotive works in Glasgow have not had so few orders on hand for years.

The Cleveland Board of Education has unanimously decided in favor of making the manual training school a part of the public school system. But the boys are not the only ones to be benefited by this new system, as it was also decided to include in this scheme domestic training for girls.

LETTERS FROM PRACTICAL MEN.

Planing Hard Steel.

Editor American Machinist:

In your column of Questions and Answers, C. B., of Cincinnati, Ohio, wants to know how to plane hard steel. Tell him to harden his tool in lemon juice, and use turpentine slush when planing. Run slow.

Chas. McKnight.

"Wanted"—A New Shrink Rule.

Editor American Machinist:

I think it would pay some enterprising firm to get up a new shrink rule, and not allow so much for shrinkage as allowed with the ordinary one.

I find, as many others do, that the one now in use is too long for general work, and especially in making long castings. The shrinkage of cast-iron is seldom more than $\frac{1}{10}''$ to a foot. In making some side frames for printing presses, lately, on which were located, at different angles, several small bosses, it was found, in laying out the holes which should have come in center of each boss, that the bosses were considerably out, though the centers on pattern were very carefully marked off by the ordinary shrink rule. I attribute this discrepancy to the use of the present shrink rule.

We have also been making some long pieces of bed plates for hoists, the longest about 12 feet. One-tenth of an inch to a foot for shrinkage was allowed on them, and they were found to come out just right for length. Gears never shrink more than $\frac{1}{10}''$ to a foot; and my experience is that $\frac{1}{10}''$ to a foot for cast-iron shrinkage is better than $\frac{1}{8}''$. I know there is a great difference in moulders, for some will make a casting larger than pattern. At least I have found so in Chicago.

P. S. Dingey.

Chicago, Ill.

An Inquiry.

Editor American Machinist:

I am using a cupola, 20 inches in diameter, with two rectangular tuyeres, 2 by 7 inches each, and 14 inches above bottom, run by a No. 6 Sturtevant fan, running about 2,000 revolutions per minute, and melting 2,500 lbs. white iron to a heat, but have much trouble with lining burning out. Am using common clay and fire-brick for lining, but have to reline nearly every heat. Will some of your readers give me a remedy? W. M. F.

A Criticism—Inside Lap of Slide Valves.

Editor American Machinist:

In your issue of March 12th is an answer to question of C. D. T., which I think may be improved. You give at 100 revolutions the horse-power of shaft as being from thirty-four to fifty (34 horse-power to 50 horse-power). This is far below what some shafts carry every day in practice.

There is a $3\frac{3}{8}''$ shaft of about eighty feet (80′) length in this town, which at ninety-five revolutions (95 revolutions) is transmitting above one hundred and twenty horse-power (120 horse-power.)

It is a shaft taking power from bevel wheel at one end and driving a flour mill by spur gear at other end.

This mill makes about two hundred and twenty barrels (220 barrels) of flour a day, and when steam is used to drive it requires 100 pounds pressure on boiler with a Cummer engine of $12''\times30''$, condensing, running 125 revolutions. And this engine does not give power in the mill that water wheel does, and as all the water wheel's power is carried by this $3\frac{3}{8}''$ shaft (with journals about 10′ apart) it looks as if this shaft must be carrying from 120 horse-power to 160 horse-power, or about three times the power you stated.

This has run for about four years, and does not give any trouble while in line, though it has broken once by one end sinking down some $12''$ on account of foundations of wheel house washing out, and the owners did not reline the shaft until it broke, since which relining it has run all right.

Some time since I saw several letters from parties in your paper discussing inside laps in slide valves, and my attention was drawn to a new valve ordered from our shop to replace one broken on a saw mill engine.

This engine is 10″×15″, and while running saw mill makes 275 revolutions, nearly 700 piston feet per minute.

The valve had outside lap of 1″, stroke of 4″, and inside lap of $\frac{5}{8}$″, was reported as doing good work for years, though at a slower speed than above given.

The new valve was made same as old one, and while visiting this mill I inquired how they were getting along.

The engineer said he thought there had been too much inside lap, so cut out $\frac{1}{8}$″ leaving $\frac{1}{2}$″. This engine is now running a flour mill when saw mill is not running, and is easy to keep steam, and the owner says he is well satisfied with engine, both for power and economy.

I have examined a number of the best threshing and portable engines in this section of country, and find nearly all have considerable inside lap.

We have just repaired another engine of 8″×12″ with 2$\frac{1}{2}$″ travel of valve which has $\frac{5}{8}$″ outside lap and $\frac{7}{16}$″ inside lap. As many engineers say there should be no inside lap, how can they explain that the best slide valve engines in this part of the country work well with a large inside lap. J. E. M.

[Our answer as given accords with the practice of some of the best manufacturers of shafting in the country. It gives a fairly large margin of safety. It is undoubtedly true that a shaft will transmit, for a time, several times the power given in that answer, but it will be strained to a degree that it will be likely to fail at any time, which is not desirable. Pressure may be carried on a boiler, ordinarily, two or three times greater than allowed, but it is bad policy to do so. We could have given examples of shafts doing much more work than that our correspondent names, but we do not advise that shafts be loaded to that extent.]

Wrought-Iron vs. Steel for Locomotives.

Editor American Machinist:

I have watched with interest the results of your inquiry into the use of iron versus steel for certain parts of locomotives. As the Canadian climate may justly be considered especially hard on locomotives, I may tell you what my practice to-day is, after an experience of nearly 10 (ten) years on Canadian railways.

For crank-pins I use nothing but the best "Lowmoor" iron hammered bars. I order this in the bar according to dimensions of the crank-pins to be manufactured. I then forge it down in dies under a heavy steam hammer, and case-harden the pin before putting it into service, and I have yet to find a "Lowmoor" crank-pin thus made and put in a properly designed engine to fail. My side-rods are iron forged under a 3,000 pound steam hammer from the very best selected scrap.

Driving axles are mild Siemens-Martin forged steel, main rods and guide bars are of the same material. For crossheads I use cast-steel with hard brass gibs.

I have tried cast-iron gibs, but reports are unanimous from all divisions of the road against their giving satisfaction. The use of cast-iron has been given up for this purpose.

Rocker arms and radius links are cast-steel; I have also used cast-steel eccentric straps, which generally have given satisfactory results.

I attach you herewith tracings of our S. A., S. B. & S. D. crank-pins, and I will add that batches of axles are tested with drop test P. R. R. standard, and it is, in my opinion, to the enforcing of this and other thorough tests that the success of the C. P. R. R. in using steel is mainly due.

Francis R. F. Brown, M. E.
Mech. Supt. Canadian Pacific R. R.

Cores of Plaster Paris and Brick Dust.

Editor American Machinist:

If No. 111, correspondents' column March 12th, will use equal parts plaster paris and brick dust (common brick) wet with water, make into batter and pour it into core box or form as the case may be, let it set until it gets hard, then bake in oven, put core in mould slightly warm, it will make a nicer core than sand. Core should be rodded same as for sand. Small cores of this I never vent. F. Kavanaugh.

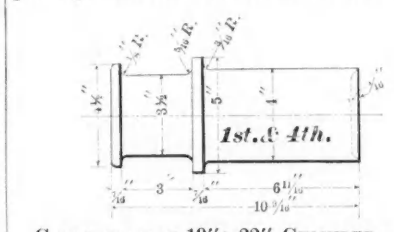
Rusk, Texas.

How to Run a Locomotive with a Tire Broken.

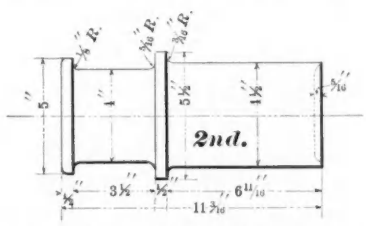
Editor American Machinist:

In your issue of March 5, J. C. asks how he can bring a locomotive in with the main tire broken. He can bring the same in by putting a wooden block under the box. An engine can then be run on three wheels. If none of the connecting rods or pins are injured it is not necessary to disconnect either side. But if one side of the engine must be disconnected the engine can still be run with one cylinder and by driving one wheel. Would like to hear from some one else on the subject. C. Mattice.

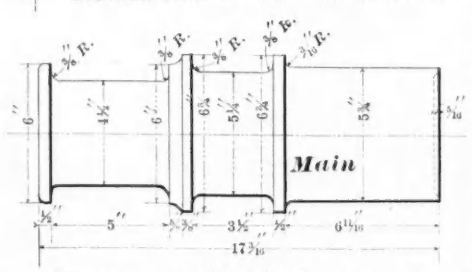
Brookings, Dakota.



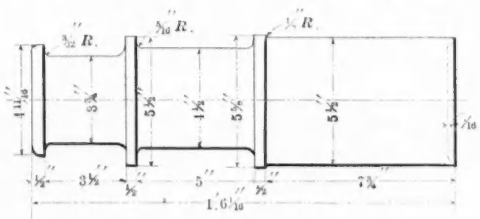
Consolidation 19″×22″ Cylinder.—1.



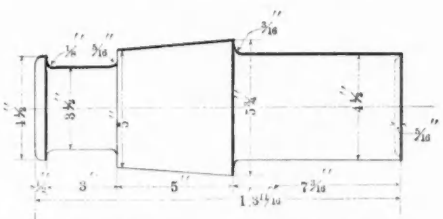
Consolidation 19″×22″ Cylinder.—2.



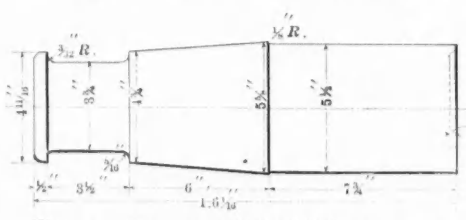
Consolidation 19″×22″ Cylinder.—3.



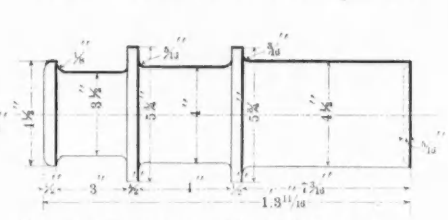
Driving Crank-pin 17″×22″ Cylinder.



Trailing Crank-pin 19″×22″ Cylinder.



Trailing Crank-pin 17″×24″ Cylinder.



Driving Crank-pin 19″×22″ Cylinder.

Preventing the Breaking of a Crank-Pin.

Editor American Machinist:

Mr. Hoffman's letter in your number of March 12, recommending the boring out of center of crank-pin (which I anticipate would give the pin a certain amount of advantageous elasticity), reminds me that one of our foremen, J. Storer, quotes a case of a locomotive repeatedly breaking crank-pin, and the difficulty was overcome by slightly reducing the diameter of the pin in the wheel fit, so that the pin fitted the bore only at each end, say for a distance of about 1$\frac{1}{4}$″

In the rough pen sketch, Fig. A, attached,

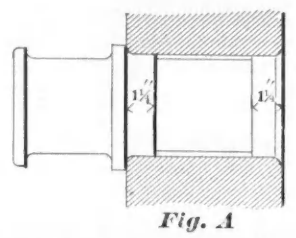


Fig. A

Crank-pin, Grand Trunk Road.

I have exaggerated the under cutting of the pin in the middle of length of wheel fit. In practice it only just cleared the metal of the hub.

J. Davis Barnett,
Mech. Supt. Midland Div. Grand Trunk R. R.

Facts About Heating and Lighting of Railroad Cars.

A bill now before the Rhode Island Legislature relating to the heating and lighting of railroad cars contains, among a number of provisions, the following: "That cars shall be lighted by gas or electricity; that no fire shall be lighted or built except in the locomotive."

On March 4 the House Committee on Judiciary gave a hearing on this bill to a number of representatives of railroad corporations and of heating systems. The following facts are abstracts from the arguments:

The Boston and Albany estimates the cost of heating a car by stoves at $50 a year; the Old Colony at $35 to $40; the Providence, Warren and Bristol cannot do it with less than 4 or 5 tons of coal a year for each car.

In regard to heating cars by steam it is stated: Nobody knows how to heat a railroad train of more than six cars by steam. Experiments on the Bristol road prove that short trains—and in not very cold weather—can be heated successfully by steam. Some roads have to run trains of fifteen or sixteen cars; and if these roads are compelled to heat the cars with steam, trains must be broken up, which is simply impossible, as trains are now run almost in sight of each other. To heat a car from zero to 70 degrees takes about 1 hour and 20, and as soon as the engine is detached the cars cool, which cannot be called a success. If a steam pipe breaks with a pressure of five pounds, the released steam will scald instantly; a higher pressure would not be so injurious. One of the representatives expressed an opinion that it was possible to heat a train of ten cars by steam, but up to the present time it has not been accomplished, and there is no instance of a long and heavy train attached to a hard-worked locomotive having been heated by steam.

Still, with all these difficulties in the way, we are glad to learn that railroad companies are continuing the experiments and seeking safer and better methods of heating cars than previously in use. They recognize the terrible responsibility of injury to passengers in the train, and simply ask to be allowed to use their own judgment and time in meeting and overcoming difficulties in heating cars by safer methods. We are also aware that to bring these experiments to a successful conclusion will involve a great expense. But, still we believe that any act of Legislature which will hasten these experiments and bring about better and safer methods of heating and lighting railroad cars will be hailed with delight by the traveling public, and will be advantageous to both the railroad companies and their patrons. But stoves must go. In regard to lighting cars by electricity, slow progress has been made, as this mode of lighting cars is still in its infancy.

A New Use for Graphite.

John A. Walker, Secretary of the Dixon Crucible Company, sends us the following:

"From time immemorial steam and gas fitters have used red lead in making joints and connections. It has been a matter of tradition with them that nothing else could possibly answer as well. However, after a few months have passed it is found that the red lead was 'set,' and it is next to impossible to open a joint. The fitter applies his tongs with all his strength, and, in a large percentage of cases, the joint is finally broken, and the tongs sprung, sometimes almost beyond repair. The progressive fitter has found that graphite (black lead) carried ready mixed for the purpose, or carried dry and mixed with best boiled oil, as occasion requires, makes an infinitely better joint. Being a natural lubricant it enables the fitter to make a much tighter, and, consequently, a much more perfect joint. Further, a joint so made can remain three months, or three years, or thirty years, and will then yield to the ordinary pressure of the tongs. It will make a better joint with less leakage, and render absolutely unnecessary the breaking of joints and couplings, and the straining of tongs. The graphite should be pure and of the right degree of pulverization."

The *Engineer* states: "The Americans are again waking up to the notion that heating cars by steam is a possibility, but in this matter their aversion to improvement would do credit to the most obdurate of old Eastern nations. Heating cars by steam from the locomotive has been done over and over again, but America is now discussing the possibility of the thing." Americans are well aware that cars have been heated and are heated by steam from the locomotive, and are not discussing the possibility of the thing. Trains consisting of five or six cars have been heated in this manner. The question discussed by Americans, is: "Which is the best method of heating by steam a train consisting of fifteen and sixteen cars, the locomotive being worked to its full capacity in hauling this train?" Also if the money expended in experiments made by the different railroad companies to bring this problem to a successful conclusion indicates aversion to improvement by Eastern nations, Americans will not be ashamed to follow in their footsteps.

Literary Notes.

THE METAL TURNER'S HANDYBOOK. A Practical Manual for Workers at the Foot Lathe: Embracing information on the tools, appliances and processes employed in metal turning. By Paul Hasluck. Published by Crosby, Lockwood & Co., London. Price, 2s. (50 cents).

This book appears to consist of manufacturers' advertisements of small lathes and appliances. Looked at in this light, we should say it was a success. Those who are interested in knowing what they can buy in these lines, and for what money they can buy, will, we should think, be satisfied with the book. Those who buy the book with the idea that they are to get something of value as a guide to metal turning will be likely to be disappointed.

Nearly every builder of machine tools in the country has orders for some months ahead, which indicates good future machine business.

Modern Locomotive Construction.

By J. G. A. Meyer.

THIRTY-FIFTH PAPER.

VALVE GEARS WITH ROCKERS.

In our previous papers we have shown, theoretically and practically, how to set the eccentrics in simple valve gears in which rockers are not employed, and in which the connections between the eccentric and valve are direct, and also in which the center line of motion of the valve gear coincided with that of the piston.

Let us now continue the subject of setting the eccentrics in the following order: First, how to find the position of an eccentric in a valve gear in which a rocker with arms of equal length is used, and in which the center line of motion of the valve gear coincides with the center line of motion of the piston. Second, how to find the position of the eccentric in a valve gear in which a rocker whose arms are not of equal length is used, and in which the center line of motion of the valve gear coincides with that of the piston. Third, to find the position of an eccentric in a valve gear in which a rocker is used, and in which the center line of motion of the valve gear does not coincide with that of the piston.

1. TO FIND THE POSITION OF AN ECCENTRIC IN A VALVE GEAR HAVING A ROCKER WHOSE ARMS ARE OF EQUAL LENGTH, AND THE CENTER LINE OF MOTION OF THE VALVE GEAR COINCIDES WITH THAT OF THE PISTON.

In order to make this subject as plain as possible, let us take the following example:

Example 39. Lap of valve, $\frac{15}{16}$ of an inch; lead, $\frac{1}{16}$ of an inch; travel of valve, 5 inches; length of each rocker arm, 10 inches; find the position of the eccentric.

In the twelfth paper we have explained how to find the position of an eccentric in a simple valve gear in which no rocker is employed, and in the same paper we have also shown that, in simple valve gears of this kind, the eccentric must travel ahead of the crank.

It is now to be shown that when a rocker is interposed between the eccentric and valve without making any other changes in a simple valve gear, such as described in the twelfth paper, the eccentric must follow the crank, instead of traveling ahead of the same; and it is also to be shown that, when the rocker whose arms are equal in length is used, the angular advance of the eccentric will be laid off in a different direction from that in a simple valve gear; but the amount of angular advance will remain the same in both cases.

In order to point out clearly the reason why this should be so we have illustrated in Fig. 197 two connections between the valve and eccentric. 1st. The upper connection marked "Case 1" is that in which no rocker is employed. 2d. The lower connection, marked "Case 2," is that in which a rocker is interposed.

In Case 1 the center C of the crank shaft is in line with the valve; in Case 2 the center C_2 of the crank shaft is situated below the valve so as to admit a rocker.

In the twelfth paper we have seen that the angular advance of the eccentric is laid off from a line drawn perpendicular to the center line of crank. This method is also applicable to the example now under consideration; but since this rule will not give correct results in laying out all valve gears, such as are to be considered hereafter, it will be best first to establish a rule which can be applied to all cases. It is this:

RULE 13. The angular advance of the eccentric must be laid off from a line drawn perpendicular to the center line of motion of the valve gear. Hence, if this rule is to be used, before we can find the position of the eccentric in case 1, or in case 2, Fig. 197, we must draw the center line of motion of the valve gear. To do this in case 1, we draw a line, $L\ M$, through the center C of the shaft, and in a direction in which the valve moves. This line $L\ M$ will be the center line of motion of the valve in case 1. In case 2 we draw a line, $L_2\ M_2$, through the center C_2 of the shaft and tangent to the arc $s\ t$, described by the center R of the lower rocker arm pin.* This line $L_2\ M_2$ will be the center line of motion of the valve gear in case 2.

Now let us apply the manner given in the twelfth paper, for finding the position of the eccentric in case 1, Fig. 197. First, draw the center line of motion $L\ M$; from the center C of the shaft, and with a radius of $2\frac{1}{2}$ inches (equal to half the throw of the eccentric in our example), describe a circle, $f\ d\ g$; the circumference of this circle will represent the path of the center of the eccentric. Through the center C of the shaft draw a line, $d\ e$, perpendicular to $L\ M$. Let A represent the position of the center of the crank-pin, when the crank is on the dead center, or, in other words, when the piston is at the beginning of the stroke.

Now, since the conditions in our example demand that the center line of the valve gear shall coincide with that of the piston, it follows that the center A of the crank-pin must lie in the line $L\ M$, and when in this position, the valve must have opened the steam port $\frac{1}{16}$ of an inch, which is equal to the amount of lead, and occupy the position as shown in the figure. To find the position of the eccentric which will correspond with that of the valve, and enable the shaft to revolve in the direction as indicated by the arrow, we continue our construction as follows: From the center C on the line $L\ M$, away from the crank-pin A, lay off a point, h; the distance between C and h must be equal to the sum of the lap and lead, namely 1 inch. Through the point h draw a straight line, $h\ x$, parallel to the line $d\ e$, cutting the circumference $f\ d\ g$ in the point x; this point x will be the required center of the eccentric, and will travel ahead of the crank, when the latter rotates in the direction of the arrow, and thus open the steam port more and more during the time the shaft revolves through a certain distance, and then close the port, as it should do. In the twelfth paper we have drawn the line $d\ e$ perpendicular to the center line of crank. In this paper we have drawn the line $d\ e$ perpendicular to the center line of motion; but since the center line of crank and the line of motion coincide, the result is the same.

To find the position of the eccentric when a rocker is used, as shown in case 2, Fig. 197. For the sake of convenience and easy comparison, let us draw the center line of motion $L_2\ M_2$ of the valve gear parallel to $L\ M$ in case 1; also let us place the center C_2 of the shaft in a line drawn perpendicular to the lines $L\ M$ and $L_2\ M_2$, and low enough so as to admit a rocker with arms each 10 inches long. Let o represent the fixed center of the rocker shaft, and the line $i\ k$, drawn through o perpendicular to $L_2\ M_2$, the center line of the rocker arms when these stand midway of their travel, and which will correspond to the position of the slide-valve when the latter stands in a central position, not shown in these illustrations. Now, it must be evident that when the valve stands in the position as shown in the figure it has moved 1 inch (the sum of the lap and lead) out of its central position, and consequently the center of the upper rocker arm pin must have moved out of its central position the same amount in a horizontal direction (not measured on the arc described by the center of the pin), and therefore the center of the pin will be at l when the valve stands in the position as shown. Through the centers l and o draw a straight line $l\ R$, cutting the arc $s\ t$, described by the lower rocker pin, in the point R. This point R will be the position of the center of the lower rocker pin when the upper pin is at l; and, as will be seen, these pins will then be located in the opposite sides of the line $i\ k$; but the distance between the center R and the line $i\ k$ will be the same as that between the center l and the line $i\ k$, namely, 1 inch, because the rocker arms are of equal lengths. Also notice that as the pin l travels in the direction of the arrow 2, as it should do, the pin R will travel in an opposite direction indicated by the arrow 3. When the valve stands in the position as shown, the crank-pin A_2, in case 2, will be on the same side of the shaft as A, in case 1, and will lie in the line $L_2\ M_2$, because, according to the condition in our example, the center line of motion of the valve gear coincides with that of the piston. Therefore, to find the position of the eccentric to correspond with that of the crank, we continue as follows: Through the center C_2 of the shaft draw a line $d_2\ e_2$ perpendicular to $L_2\ M_2$; and from the center C_2, and with a radius of $2\frac{1}{2}$ inches, describe a circle $f_2\ d_2\ g_2$; the circumference of this circle will represent the path of the center of the eccentric. From the center C_2, on the line $L_2\ M_2$, and towards the crank-pin A_2, lay off a point h_2; the distance between the center C_2 and the point h_2 must be equal to 1 inch, because the horizontal distance between the point R and the line $i\ k$ is 1 inch. Through the point h_2 draw a line $h_2\ x_2$ parallel to the line $d_2\ e_2$, and cutting the circumference $f_2\ d_2\ g_2$ at the point x_2; this point x_2 will be the required position of the eccentric, in case 2, when the crank-pin is at A_2 and the shaft is to rotate in the direction indicated by the arrow. If in case 2 we had found the position of the eccentric in precisely the same manner as that employed in case 1, and had placed the eccentric at y and thus caused the eccentric to travel ahead of the crank as in case 1, a movement in the wrong direction would have been communicated to the rocker pin R, which would make the valve close the steam port at this particular time instead of opening the same as it should do. Also notice that y is one end of the diameter of the circle $f_2\ d_2\ g_2$, and x_2 is the other end of the same diameter.

From this we learn that in a valve gear in which a rocker with arms of equal lengths is introduced the eccentric must be placed in a position directly opposite to that of an eccentric in a valve gear in which no rocker is used; also when the amount of lap and lead in case 1 is the same as that in case 2, then the angular advance in both cases will be equal, although laid off in opposite directions.

When two eccentrics and a link are to be used, as in locomotives, then, in order to find the position of the second eccentric, prolong the line $h_2\ x_2$, so as to cut the circumference $f_2\ d_2\ g_2$; this point of intersection will be the center of the second eccentric. See twenty-seventh paper.

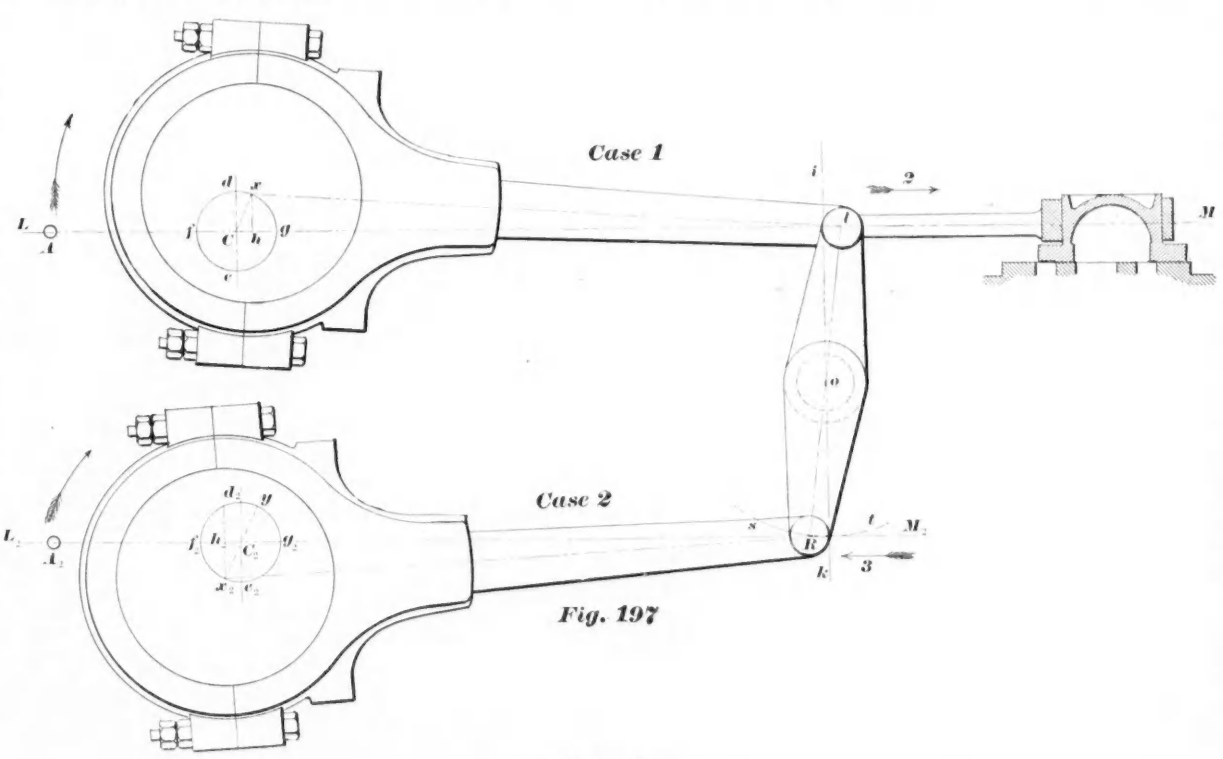


Fig. 197

VALVE GEAR.

Consumers of coal, whether for manufacturing or domestic use, seldom know whether they receive full weight. It is not always convenient to weigh coal when received. Recently a citizens' association in Brooklyn engaged weighers to ascertain in numerous instances whether dealers deliver 2,000 pounds or something less for a ton. They weighed the coal just after delivery, and found that 57 out of 58 dealers were cheating their customers by short weight. The alleged tons weighed from 1,674 to near 2,000 pounds. Most of the coal weighed fell short over 50 pounds to the ton. The publication of these facts, with names of dealers who are cheating their customers, has caused some excitement in Brooklyn. It is quite likely that if similar investigations were made in other cities, like results would be found.

Mr. J. H. Setchel, Dunkirk, N. Y., Secretary of the American Railway Master Mechanics' Association, requests us to say that the price of annual reports of that association is at $1.50 a copy. The reports are well worth that or more to any one intested in railroad mechanical matters.

In discussing the failure of the bill to create an agricultural department to be headed by a cabinet officer the New York *World* says: "So far as the diffusion of knowledge is concerned, one good agricultural journal amounts to more than half a dozen executive departments possibly could."

It is said to cost the United States as much in the way of pensions as it costs the German government to maintain its regular army. Well, in the first place the money is put to good use; in the second it is thrown away.

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*Drawing this center line of motion tangent to the arc described by the lower rocker arm pin is not absolutely correct, but is near enough, and generally considered so, for all practical purposes in locomotive construction, or in engines having eccentric rods of the ordinary length; that is, engines not having very short eccentric rods.

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☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, APRIL 2, 1887.

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Industrial Activity.

It is an undisputed fact that manufacturing industries have been gaining during the last few months. An increasing volume of business has been done and more hands have been employed. The gain has not been rapid, but steady, and a comparison of the situation with that of one year ago shows decided progress. With the exception of iron and steel, prices of leading commodities have not materially advanced. Prices of machinery remain low, and some advances must be made. One of the most gratifying features recently is the marked increase of orders for steam engines and boilers. These orders come from about every class of industry that can use power, and they indicate substantial improvement in general business. Railroad traffic can easily be tabulated for comparison at different dates. The increase in this line is strong and decided. It is a good indicator of commercial prosperity. More railroad repair shops are to be built this year than for several years before. The demand for cars and locomotives has continued to enlarge, and every shop seems to be full of orders, usually booked for months ahead. Machine shops are generally busy, with good prospects ahead. Recently wages have been advanced in a number of iron and steel mills. Activity in building iron furnaces and manufactories in the South is remarkable. Large amounts of Northern capital are being invested in developing the natural resources of that section. This has created a boom in some Southern localities. The bonus plan of attracting manufactories is stimulating parties to start productive enterprises that would not otherwise take the risk of starting them. Everything points to a busy spring and summer, except the locking up of money in the U. S. Treasury. It is hoped that some plan may be devised to get a good portion of that great and increasing hoard of money into circulation, and thus enable business to be done with shorter credits and on a safer basis.

It is a sad commentary on the administration of justice that a peripatetic agent of a society for the prevention of something or other is sent out from New York to aid and abet in the mild gambling of "hog guessing," for the purpose of acting as a witness in a criminal prosecution, while stock guessing, involving millions of dollars and the financial ruin of thousands, goes on without rebuke. "Hog guessing" may be wrong, and all that, but what of the gambling in wheat, that, so far as anybody cares about it, affects—often with starvation results—those who do not engage in it? We imagine that the strongest argument that can be used against gambling is that the innocent suffer for the sins of the guilty. But it makes all the difference in the world whether the gamblers are large ones or small ones.

A State Taxing Inter-State Commerce.

A recent decision of the United States Supreme Court in Tennessee indicates that some State laws need revising. The commercial traveler of a Cincinnati stationery firm was soliciting orders in Memphis and exhibiting samples to make sales. A State law applicable to that single district required all drummers who did not have a regular licensed house in the district to take out a license to sell by sample, paying $10 a week or $25 a month. The Cincinnati drummer was arrested, tried and fined for not having a license, and on appeal the judgment was confirmed. Justice Bradley, in giving his decision reversing the former finding says:

1. The Constitution gives to Congress the power to regulate commerce among the States, and that power is necessarily exclusive whenever the subjects of it are national in their character or admit only of one uniform system or plan of regulation.

2. Where the power of Congress to regulate is exclusive, its failure to act indicates its will that the subject shall be left free from any restrictions or impositions, and any regulation by the States, except in matters of local concern only, is repugnant to such freedom.

3. The only way in which commerce between the States can be legitimately affected by State laws is when, by virtue of its police power and its jurisdiction over persons and property within its limits, a State provides for the security of life, limb, health, comfort, and property, or when it does those things which may incidentally affect commerce. But in making such internal regulations a State cannot impose taxes upon persons passing through or coming in merely for a temporary purpose; nor upon property imported and not yet become part of the common mass; and no discrimination can be made by any such regulation adversely to the persons or property of other States, and no regulation can be made directly affecting inter-State commerce.

The Judge then proceeds to show that taxing goods brought into a State and before their sale is a tax on inter-State commerce itself.

The laws taxing drummers ought to be repealed everywhere in this country.

The special exemption of railroad property from taxation is not new, but in Sheffield, Ala., a novel reason is given for it. The city council of that place has passed an ordinance exempting railroad property from taxation for twenty-five years in consideration of delivering freights at manufacturing establishments without charging for switching. Perhaps it did not strike the city fathers that the railroads could charge enough more for the regular haul of freight to cover the possible revenue from the short haul on the switch. Certain it is the quota of taxes which would be paid by the railroads must hereafter be paid by the other owners of property in Sheffield, and the bulk of it will probably fall upon the manufacturers. The railroads have a good bargain, and we don't blame them for accepting it.

The Fink Lubricating Mixture.

We hear that John Fink is still traveling about the country to sell shop rights of his wonderful patent lubricating compound or mixture, which is composed of chalk, potash, water and oil. We have published letters from a large number of establishments that have been victimized by John Fink into purchasing shop rights upon his representation that the mixture will effect a large saving in oil. With but a very few exceptions, all from whom we heard found Fink's mixture a flat disappointment, and could not use it. The few exceptions were favorable to the mixture, and we published all the letters we received giving experience with the stuff. Fink (who often travels with his younger brother, W. B. Fink) has peculiar but very alluring methods of selling shop rights. He carries a book filled with genuine contracts for shop rights made out by the parties purchasing, and he has some testimonials which have since been rescinded by the parties giving them. He talks smoothly, and often when about to close a contract is in a hurry to catch a train. He has been arrested in different cities, but has always managed to get clear in some way or another.

Recently an elderly woman accompanied by a younger one visited our office, declared she was the mother of John Fink, and demanded that we retract what we have published about Fink and his mixture. Upon our declining positively to do anything of the kind she went away threatening to bring suit against us at once.

We have received a letter from E. J. Armstrong, of the Weston Engine Company, Painted Post, N. Y., which says: "Your old friend J. or H. Fink, of oil compound celebrity, was here this afternoon (March 12). He is a very smooth talker—indeed, if it had not been for the AMERICAN MACHINIST, and the smell of whiskey in his breath, he might have stood some show with us. I write to express my sympathy for you, as he says that his brother will have one of you sent to State's prison within two weeks. Hope it won't interfere with getting out the A. M. regularly."

We are still doing business "at the old stand," and do not expect to go to State prison.

John Fink and his brother called at our office once and exhibited their collection of contracts for shop rights and a few commendations of the mixture. If we had not already learned that the writers of a large part of them had repudiated the mixture we might have been captivated into the belief that it is a first rate article. We have no personal spite against the Finks, but on the contrary rather admire John's smartness. Our object in publishing the information regarding his operations is to give our readers facts for their own protection.

The appointment of James C. Bayles, editor of the *Iron Age* and the *Metal Worker*, to the position of President of the New York City Board of Health, by Mayor Hewitt, is a very good one, although it does not please the politicians. The fact is, Mr. Bayles is more of a sanitarian than a politician. He is a man of known executive ability, and at the head of the Board of Health will probably make it more efficient than it has been before.

A manufacturer who has for years been intimately connected with pipe and fittings machinery, suggests that very material modifications will have to be made in fittings before the new standard can be employed. Not only do many fittings, as now made, lack the length of thread called for on the pipe, but in many elbows the turn is so short that the new standard thread on the pipe would bottom. It appears that reform must cover, at once, both pipe and fittings.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(139) B. C., Boston, Mass., will find directions for etching on steel in the AMERICAN MACHINIST of January 22, 1887.

(140) C. M., Bennington, Vt., will find description of "hog nose drill" in the AMERICAN MACHINIST of September 12, 1885.

(141) A. W., Boston, Mass., asks: At what temperature will steel springs begin to lose their temper? *A.*—Probably between 500° and 600°.

(142) R. M. will find instruction for reducing observe boiler evaporation to equivalent evaporation from and at 212° in the AMERICAN MACHINIST of October 18, 1884.

(143) Machinist, New Haven, Conn., asks: 1. Is it best to use oil in tapping cast-iron? *A.*—Yes. 2. What is the theory of the water polish on wrought iron? *A.*—The water lubricates the tool, preventing tearing of the metal.

(144) W. W., Nashville, Tenn., asks: Why do the rubber bands fly off my band-saw wheels? Please let me know the reason and the remedy. *A.*—We cannot tell. Perhaps they are not wide enough; perhaps the pulleys are not in line. We cannot judge at this distance.

(145) A. C., Ayer, Mich., asks: Can air be compressed to 200 lbs. pressure per square inch without water jackets or other means to reduce temperature? *A.*—Air compressed to that pressure without loss of heat will have a temperature of about 1,000°, which would be too high for your machinery to satisfactorily stand.

(146) S. H., Houston, Tex., asks: What cement can I use to cement leather to metal, the reverse side of the leather being exposed to water under pressure? *A.*—What you desire is hard of accomplishment. Try a cement made by mixing four parts india-rubber, two parts caulkers' pitch, and one part linseed oil. These should be melted together and used hot.

(147) F. H. B., Holyoke, Mass., asks: Is there a process for making "blue prints" in reverse—that is, printing blue on white, instead of white on blue? *A.*—Yes; see AMERICAN MACHINIST, page 4, January 22d, 1887. We have seen blue lines on white ground produced by other processes, which can only be obtained by paying the inventors, with the understanding that the secret is not to be given to others.

(148) H. L., Brampton, Ont., asks: In designing a link motion of the locomotive type, by what means is the length of the throw (or movement) of the link determined? *A.*—The throw of the eccentric should, at least, be sufficiently great

to cause the valve to open the steam ports fully; some designers make the throw great enough to cause the valve to travel ⅛ to ¼ of an inch beyond the edges of the steam ports. You will find this fully explained in the AMERICAN MACHINIST, page 2, October 10th, 1885, and page 4, September 4th, 1886.

(149) Do you advise the use of the test pump in testing boilers in use, and if so what especial care should be taken? *A.*—We do not think there are any good objections to the use of the test pump, provided it is used judiciously. The precautions we should take would be to first examine the boiler thoroughly to determine if it could with perfect safety, so far as could be judged, withstand the pressure it was proposed to apply with the pump; then, if possible, we should test with water that had been warmed.

(150) G. A., Mine La Motte, Mo., writes: Can we burn coke dust and coke that has been screened through half-inch mesh by blowing cold air under the grate bars? I had always thought that just as little air as is practicable should be let in under the bars. *A.*—It is a question of getting air through the fine fuel to support combustion. Without a blower you will not probably be able to force the air through the fuel. Fine fuel is successfully burned by blowing cold air under the grate. Of course you should not let any more air through the fire than is neeessary.

(151) E. W., Norwich, Conn., writes: We are troubled with sand clinging to castings after using the vitriol bath. I would like to know in what proportion to use the vitriol bath; also how to use the hydrometer in mixing? *A.*—The proportions are usually from seven to ten parts of water to one of vitriol. The only way we could see for using the hydrometer is to first find out the mixture that gives good results, then test with the hydrometer, and make future mixtures to the scale of hydrometer. We do not believe it of any use. Scale will always stick a little, and is best removed by a stream of water under pressure.

(152) Three Readers, New York, ask: 1. How can we make the calculations in regard to lever-weighted safety valves? *A.*—You will find this fully explained in the AMERICAN MACHINIST of December 6, 1884. 2. How can we find the horse-power of an engine? *A.*—You can only find the horse-power of an engine by applying the indicator. The horse-power is found by multiplying the area of piston in square inches by the piston speed in feet per minute, and by the mean effective pressure, and dividing by 33,000. A well-constructed non-condensing engine, working with steam from 70 to 100 pounds, ought to work up to a mean effective pressure one-half the boiler pressure. From this you can approximate the power.

(153) J. H., Rochester, N. Y., writes: In reference to a recent article in the AMERICAN MACHINIST on "Revision of Steamboat Rules and Regulations," I should like to ask: 1. How shall I determine the weight necessary to be placed on a safety valve? *A.*—You will find plain rules for this in the AMERICAN MACHINIST of December 6, 1884. 2. How shall I find the strain brought to bear on boiler braces? *A.*—In bracing flat surfaces in a boiler, consider that the braces must take all the strain. If then you find the area of the flat surface in square inches, multiply this by the pressure in pounds per square inch, and divide by the number of braces, you will have the strain on each brace. Suppose you have 500 inches of flat surface, the pressure carried being 100 lbs. That gives 50,000 lbs. due to the pressure. If you have 10 braces, each brace will be strained 5,000 lbs.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Gear Wheels. See Geo. B. Grant's adv., page 16.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Extra capacity, hollow-spindle Hand Lathes; correspondence solicited. J. R. Rand, Brattleboro, Vt.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Robbs' Patent Composition for case-hardening send for circular. F. W. Tasney, Paterson, N. J.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

20", 25," 28" B.G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

Ice and Refrigerating Machines. 120 built, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y

Drawing Materials, all kinds. Get catalogue. Mention this paper. G. S. Woolman, 116 Fulton st., N. Y.

20,000 addresses of steamusers and users of mach in 10 States, $10. J. N. Mills Pub. Co., 30 Vesey st., N.Y

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Veneer Machines, with latest improvements. Farrel Fdy. & Mch. Co., Ansonia, Ct. Send for circular.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co., 111 Liberty st., N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Mch. 26, p. 13. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Machinists' supplies, brass goods, m'f'rs' supplies, polishing materials, all kinds wire, metals, etc.; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

"Morrison's Practical Engineer." A complete treatise (200 pp.) on steam and general mach. Mailed on receipt of $1. W. A. Morrison, Box 373, Lowell, Mass

The Holly Manufacturing Company, of Lockport N. Y., will send, on application, their pamphlet illustrating pumping machinery and reports of duty trials.

Wanted—Numbers 1, 2 and 4 of AMERICAN MACHINIST for 1881. Will pay 25 cents each for clean copies. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

Practical Handbook on Pump Construction. Various kinds and materials to be made of for different purposes. By P. R. Bjorling. Nine plates, 12mo., $1.50. E. & F. N. Spon, publishers, 35 Murray street, New York.

New Book on Gears; Tables giving 3,094 diameters, with rules for calculation of movements of shafts, etc.; sent on receipt of P. O. Note; price 50 cts. Address C. B. Long, M. E., Worcester, Mass.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, the full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

MANUFACTURES

R. J. Myers, Mt. Joy, Pa., will erect a brass foundry.

Wm. G. Culver will erect a $10,000 factory at 219 Fulton street, Chicago.

Joseph F. Brewster, Chester, Pa., will build a brick addition to his foundry.

The Eureka Iron and Steel Works, at Wyandotte, Mich., will erect an addition.

The Athens Foundry and Machine Shops, Athens, Tenn., are being enlarged.

W. S. Bouton, Chicago, Ill., will erect a foundry on Wood street, to cost $10,000.

The Fall River Machine Company has increased its force from 112 to 160 men.

The sum of $100,000 has been raised to build a cotton factory at Charlotte, N. C.

J. B. Barnhill, of Bellaire, O., is interested in boiler works to be built at that place.

The Philip Best Brewing Company, of Milwaukee, will erect a $12,000 addition.

L. G. Schaeffer, 149 Central avenue, Cincinnati, O., will erect a foundry to cost $15,000.

The Birmingham Bridge and Forge Works, of Birmingham, Ala., will build a rolling mill.

W. G. Upchurch and others are interested in a cotton factory to be built at Raleigh, N. C.

The Letort Axle Works Company, of Carlisle, Pa., contemplates removing to Shippensburg.

It is reported that the Keokuk Wind Pump Company are to erect a large plant at Peoria, Ill.

P. H. Salisbury, Salisbury, N. C., will erect a machine shop in that place about the 1st of May.

The Ohio Falls Car Company, of Jeffersonville, Ind., will build an addition to its machine shop.

M. Lowented is president of a company that will build tube works at Oil City, Pa., to cost $125,000.

G. M. Clark & Co., 157 Superior street, Chicago, Ill., will build an addition to their stove foundry.

The St. Louis and San Francisco Railroad have secured ground to build shops at Van Buren, Ark.

The South Pittsburg City Company, South Pittsburg, Tenn., contemplates erecting a rolling mill.

A large machine shop will be built in Blountsville, Ala. J. F. B. Jackson can furnish particulars.

Dr. Chas. E. Quail is president of a company that will build a bolt and nut factory at Auburn, Pa.

J. Lorenz, 377 Iglehart street, St. Paul, Minn., will erect a two-story organ factory on Iglehart street.

A cotton factory will be built in Columbus, Miss. H. Johnston, J. D. Morgan and Dayton Hall are interested.

J. & J. Sibley will erect a three-story factory, 68x154 feet, at 128 Arbor avenue, Chicago. It will cost $20,000.

Law & Deviney, of South Chester, Pa. (P. O. Thurlow), are interested in a furnace to be erected in that place.

The Chattanooga Split Wooden Pulley Company, of Chattanooga, Tenn., are erecting a wood pulley factory at that place.

The Dowling Furnace Company, Chattanooga, Tenn., have secured a site for their blast furnace, and will proceed to erect it.

The citizens of Northwood, Mass., will give a building lot to Fowle & Sons, who propose to erect a shoe factory there, 75x40 feet.

L. G. Schaefer & Co., 149 Central avenue, Cincinnati, will erect a six-story mantel and grate factory. Estimated cost, $20,000.

Parties are negotiating with Paine & Montgomery, Dayton, Tenn., for a foundry building, with a view to establishing a stove foundry.

The Hinkley Locomotive Company, of Boston, are advertising outside for extra help, being pressed with orders from Western railroad companies.

It is said that a $250,000 machine shop for the Chicago, Kansas and Nebraska Railroad is to be built in the new town of Horton, Brown County, Kan.

The Excelsior Iron Works Company—Carlisle Mason, president, 100 North Clinton street, Chicago, Ill.—will erect an addition to its machine shops.

The New Home Sewing Machine Company have purchased a site at Council Bluffs, Ia. The Rockford (Ill.) Clock Company will also erect a factory there.

The Hendey Machine Company, machine tool manufacturers, Torrington, Conn., write us: "Our business is very good; better than at any time within three and a half years."

The Baldwin Locomotive Works in the year 1886 built 550 locomotives. The largest number ever built at these works in one year was in 1882, when 563 engines were turned out.

The new cotton factory to be erected at Columbus, Ga. (H. Johnson, president), will be exempted from taxation for ten years. Ground for a site has also been donated. All the stock is subscribed.

A company has been formed at Chattanooga, Tenn., to manufacture fence machines, with G. B. Woodworth as president; Ambrose Wagner, vice-president; L. S. Young, secretary and treasurer.

The Buffalo, Rochester and Pittsburgh Railroad Company offers to locate car shops in Ridgeway, Pa., at a cost of $125,000, provided the citizens will give the company fifteen acres of land and a bonus of $25,000.

A $200,000 yarn mill is to be built in New Bedford, Mass., The company to build the mill has been organizing with that amount of capital. Benjamin Wilcox, now a clerk in the office of the Wamsutta mills, will be treasurer.

A new foundry is to be started in Stamford, Conn. John Davenport and others are interested. Two acres of land have been bought for a site, and the first building will be 175 feet long. The work will be general jobbing.

It is reported that the Central Texas Cotton Co-operative Manufacturing Union has been organized at Georgetown, Tex., to build a large cotton factory to cost about $100,000, with E. T. May as president, and J. M. Smith, secretary.

Mayor Hill and other citizens of Florence, Mass., are interesting themselves in the establishment of a shoe shop. Shoe men from the eastern part of the State have offered to locate in town upon certain conditions, which are likely to be met.

All the machine shops and foundries now occupying the grounds and old building of the Jersey City Locomotive Works, Jersey City, will have to vacate by May 1st, as the property has been bought and will be used by the Tartar Chemical Company.

S. D. Warren & Co., proprietors of the Cumberland Paper Mills, Cumberland, Me., have commenced the foundations for a new mill, 70x70. Two new machines are to be placed in it, one of which is to make paper for the *Century Magazine*.

The contract for building the 200-ton furnace by the Pulaski (Va.) Iron Company has been let to James P. Witherow, of Pittsburgh, Pa. The terms of the contract require its completion by Sept. 1, 1887. The price to be paid is something over $200,000.

D. Saunders' Sons, Yonkers, N. Y., have recently furnished one 12-inch pipe cutting machine to the Chester Pipe and Tube Works; they have also sold six machines to the Syracuse Tube Works, and six to the new pipe works of Taylor Brothers, of Boston.

The Knights of Labor, it is rumored, are preparing to build a large manufacturing establishment at Lapeer, Mich., to make carriages, sleighs and farming implements. They have secured the promise of about one-half of the necessary amount of capital.

The Atchison, Topeka and Santa Fe and the Southern Kansas railways have decided to erect machine shops, round-houses, etc., at Winfield, Kan. The ground has been measured off, and is near Walnut Creek. Work of construction will commence immediately.

The Weston Engine Company, Painted Post, N.Y., write us that under new management they are having all they can swing to in filling orders for their specialties, the Armstrong engine and the Bronson steam heater. They will probably enlarge their shops this summer.

R. A. Johnson, Boston, superintendent of the Boston and Southern Construction Company, now building the Charleston, Cincinnati and Chicago Railroad, promises to put the shops for this road at Camden, S. C., if the vote in favor of a subscription to the road is carried.

The new buildings of the Bethlehem Iron Company, now in course of erection between its older mills and its furnace at the extreme eastern end of South Bethlehem, Pa., are truly extensive, and when completed and in operation will need the active and intelligent labor of hundreds more of willing hands.

Mr. J. H. Sternberg, of the Reading (Pa.) Bolt and Nut Works, has purchased fifteen acres of land at Kansas City, Mo., and will put in a $300,000 plant and employ 250 men in the manufacture of machine, carriage, track, bridge, roof, elevator and other bolts. These works will have a capacity of 15,000 tons of finished merchant iron.

McLanahan & Stone, founders and machinists, Hallidaysburg, Pa., have the contract for the building of the furnace for the Bellefonte Furnace Company, Bellefonte, Pa. There will be two of their large horizontal blowing engines used. They also have just completed and shipped columns, base and mantel plates for the Conemaugh Furnace.

The Universal Radial Drill Company, Cincinnati, O., issue a well-printed and well-illustrated catalogue of their radial drills. They make three designs and five sizes. They are all made to standard gauges. They note that they can refer to users in almost every section of country. All three designs have been illustrated in the AMERICAN MACHINIST.

The Garfield Injector Company, Wadsworth, O., issue a fine illustrated "railway edition" catalogue to present the peculiarities of their injector. The injector is automatic, and can be easily adjusted by the operator. It is constructed in two sections, and can readily be taken apart with the ordinary wrench. A cut of each part is shown, and directions are given for using.

The Hoppes Mfg. Company, Springfield, O., manufacturers of the Hoppes live steam feed-water heater and purifier, write us: "We are having a very encouraging trade. Have just contracted to put a large boiler feed-water purifier in the Ewan Paper Company's works, and have already furnished one of three very large ones to the Piqua Straw Board and Paper Company, of Piqua, Ohio, for their two mills."

The Jarvis Engineering Company, of Boston, issue a 56-page illustrated catalogue descriptive of the Jarvis boiler setting, as applied to various kinds of boilers. Results of several tests are given, where not only clear coal, but screenings, sawdust and other forms of cheap fuel, were used. All of them were highly satisfactory, and considerable saving was effected in coal bills. A profusion of testimonials are published; also a long list of parties using the Jarvis furnace.

The Amoskeag Company, Manchester, is now supplied with two 1,000 horse-power engines, one 2,000 horse-power, one 100 horse-power, and several smaller engines, and the time is not far distant when still another 1,000 horse-power machine will have to be added to No. 9 mill. The progressive management of the company does not believe that it is economy to have $1 000,000 invested in a mill and then allow it to lie idle for the want of $20,000, as might be the case with No. 9 mill if a severe drought should occur.—*Boston Commercial Bulletin.*

The Herrmann-Parker Hardware Manufacturing Company, St. Louis, are extending their foundry, by roofing and occupying a large space hitherto vacant, and are making other changes and improvements with a view to increased capacity and greater convenience for work. The addition to the foundry will almost, if not quite, double the output of that department, in which the force will be increased to about 100 men. Business is reported by the company to be exceedingly good. "We have more orders than we can fill" is the candid admission of Mr. Russell.—*Age of Steel.*

The H. A. Williams manufacturing establishment will undoubtedly soon be moved from Taunton to Woburn. The concern was started by H. A. Williams, a man of considerable inventive genius, a few years ago, and for a time made money making awls and fine tools for delicate work. By some means not generally known Mr. Williams' interest became less and less, until finally the Morse Twist Drill Company, of New Bedford, got possession of it. This company has now agreed to let Mr. Williams buy out at a nominal price, and he is arranging with Woburn parties for the transfer of the plant to that place.—*Boston Bulletin.*

The *Dry Goods Bulletin* says: It was remarked by an observant manufacturer this week: "Paterson is very seldom without a strike on hand. The trouble at the Pioneer Company's silk mill, which lasted seventeen weeks, was followed by a strike at Alcock's and by the iron-moulders' turnout, and that was scarcely settled before 2,000 red-handed dyers are parading the streets. If a week passes without some 'kick' among the employes, the lightning is certain to keep up the reputation of the place by striking somewhere within the city limits. If the present strike is compromised now," he continued, "I'd wager $50 there is another one inside of ten days; it's in the air."

Machinists' Supplies and Iron.

NEW YORK, March 17, 1887.

Iron—The trade in American pig has not been lively; in fact, it is generally characterized as dull. Buyers have got firmly down to the hand-to-mouth system of buying again, apparently hoping for lower prices, which holders show no intention of conceding. No. 1 X Foundry, standard brands, sell at $21.50 to $22.50; No. 2 X, $20 to $20.50; Grey Forge, $18 to $18.50.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate, 3 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—First-class patternmaker. Inquire of or address Carlos Holly, Lockport, N. Y.

Situation wanted by a first-class draftsman, good designer and machinist. Address X. L., AM. MACH.

A first-class pract. and theoret. draftsman and engineer wants position; can take charge of drawing room. Address M. E. & D., AM. MACHINIST.

A young man wants a position as designer and draftsman on special machinery; is a good mechanic educated for the business. Address O. S. U., AM. MACHINIST.

Wanted—A competent foreman boilermaker to take charge of a large shop, manufacturing portable, stationary and marine boilers. Address Roberts, care AM. MACHINIST.

Wanted—A first-class reliable salesman to sell a line of first-class machinery; none but successful salesmen need apply. Address, stating experience and salary expected, X. Y. Z., care of AM. MACH.

Wanted—Situation as mech. draftsman by a Norwegian graduate from technical school, with four years' experience in machine shop this country; references. Address Box 15, AM. MACHINIST.

Mech. draftsman wants position; used to make show drawings, full-shaded, water colors or pen and ink; quick sketcher. Address S. P. O., Box 373, Philadelphia, Pa.

Wanted—Position by an expert tool and model-maker, accustomed to precise measurement, or contract for fine machinery; No. 1 reference. Address R. M. C., 30 Oak st., Meriden, Ct.

Two first-class toolmakers and two good all-around machinists for a shop in one of the best cities in Ohio. Address, with reference and wages wanted, Manufacturer, Box 16, AM. MACHINIST.

Boilermaker—To do laying out and assist foreman at the Oil City Boiler Works; must be sober, steady and energetic. Address, giving age, experience and wages expected, Jas. Barclay, Supt., Oil City, Pa.

Machinist, age 32, with 15 years' shop experience, also skilled in erecting, wishes engagement in small city or town where himself and family can likely settle permanently; refers to present employer. Box 14, AM. MACHINIST.

A machine foreman, designer and draftsman with experience managing men and shop manufacturing fine tools and interchangeable machinery, wishes to correspond with parties in need of such a man. Address G. W. N., Box 45, Ridley Park, Pa.

A competent man, with good experience in the best machine tool shops and drawing rooms, and in sewing machine and other shops, is looking for a leading position; East preferred; intelligent service rendered and fair compensation expected. Address "Adams," AM. MACHINIST.

Wanted—Position as business manager or treasurer of a manufacturing or finance corporation, by an active business man of over sixteen years' experience; thoroughly competent to organize a new business or carry on one already established. Address T. W. J., care of AM. MACHINIST, 96 Fulton st., New York city.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Tube Expander; second to none, price in reach of all. Crescent Mfg. Co., Cleveland, O.

The Crescent Link Belt Coupling; something new; sample free. Crescent Mfg. Co., Cleveland, O.

Light mach'y of all kinds built at short notice Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

For Sale—One set of Niles pulley machinery as good as new. Address Frick Co., Waynesboro, Pa.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. I. A. Weston & Co., Syracuse, N. Y.

For Sale—One 1⅛" Merriman bolt-cutter, one 20' swing, 12 ft. bed, engine lathe, both new. The McLagon Foundry Co., New Haven, Ct.

For Sale—One Lathe, 28" swing, 20 feet between centers; one jig saw, one wood-turners' lathe. A. L. Henderer, Wilmington, Del.

For Sale—Low figure, in good order, four stationary engines—one each of thirty-five, forty, fifty and sixty horse-power. Address Pratt & Letchworth, Buffalo, N. Y.

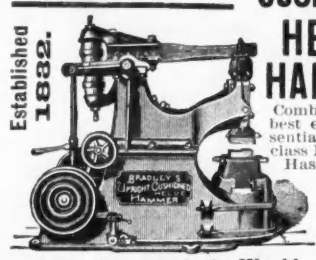
For Sale—Milling machines, drill presses, screw machines, cam machines, tapping machines, planers, lathes, etc.; send for circular. E. Parmly, Treas. the New Howe Manufacturing Co., Bridgeport, Conn.

Boilershop tools wanted—One steam riveter, 6-foot post; one plate planer, 16½ ft.; one punch, 36 inch reach, with spacing table; one set of 16-foot bending rolls; one horizontal flange punch. Above tools must be heavy and first-class; may be new or second-hand; give price and full particulars. Address Frick Co., Waynesboro, Pa.

Wanted—Second-hand bound volumes of *Patent Office Gazette* from 1870 to present, one or all. Address A. K. Mansfield, 177 La Salle st., Chicago, Ill.

An English manufacturing firm, with old-established connections all over Europe, and ample capital, desires to meet with a manufacturer of goods suitable to sell with their own to ironmongers, engineers, ship and house-builders, etc. A member of the firm will be in the U. S. in March and interview respondents. Address T. H. W., Room 87, Drexel Building, New York.

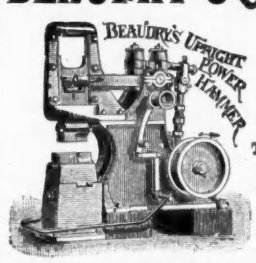
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.

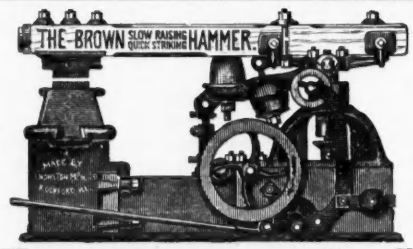
BRADLEY & CO. Syracuse, N.Y.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER



The success of our machine is the best guarantee of its value. Only hammer with patent Duplex Steel Helve which never rattles, burns or breaks. Guaranteed to do more and better work with less repairs than any other.

BEAUDRY & CUNNINGHAM, Boston, Mass.



THE BROWN HAMMER STRIKES A BLOW WITH Double the Velocity That it Raises the Hammer

A NEW MOVEMENT! SEND FOR DESCRIPTION

KNOWLTON MFG. CO., KING ST., ROCKFORD, ILL.

Unequaled for Accuracy, Strength, Durability and Simplicity of Construction.

"THE SWEETLAND" CHUCK

M'F'R'D BY THE HOGGSON & PETTIS M'F'G CO. EST. 1849 NEW HAVEN, CT.

Send for 72 page Catalogue of Chucks, Dies, Stamps, Stencils, Pipe Tongs, &c.

HODGE'S Universal Angle Union PATENTED.

Combining an elbow and union, and can be set at any angle at which it is desired to run the pipe.

Manufacturers & Wholesale Agent

ROLLSTONE MACHINE CO., 45 Water St., FITCHBURG, MASS.

GEO. F. BLAKE MANF'G. CO.

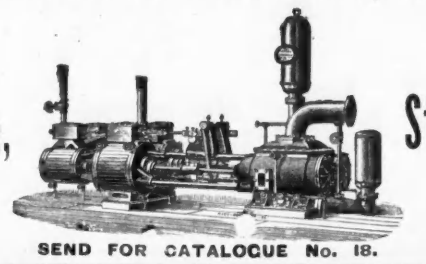
BUILDERS OF EVERY VARIETY OF

95 & 97 LIBERTY ST., 44 WASHINGTON ST., NEW YORK. BOSTON.

WATER WORKS PUMPING ENGINES A SPECIALTY

THE DEANE STEAM PUMP CO., Holyoke, Mass.

BUILD Water Works, ENGINES AND Steam Pumping MACHINERY.



SEND FOR CATALOGUE No. 18.

PLANERS

Ready for immediate delivery:

16 Inch × 16 Inch × 4 Foot Planer.
22 " × 22 " × 5 " "
24 " × 24 " × 6 " "

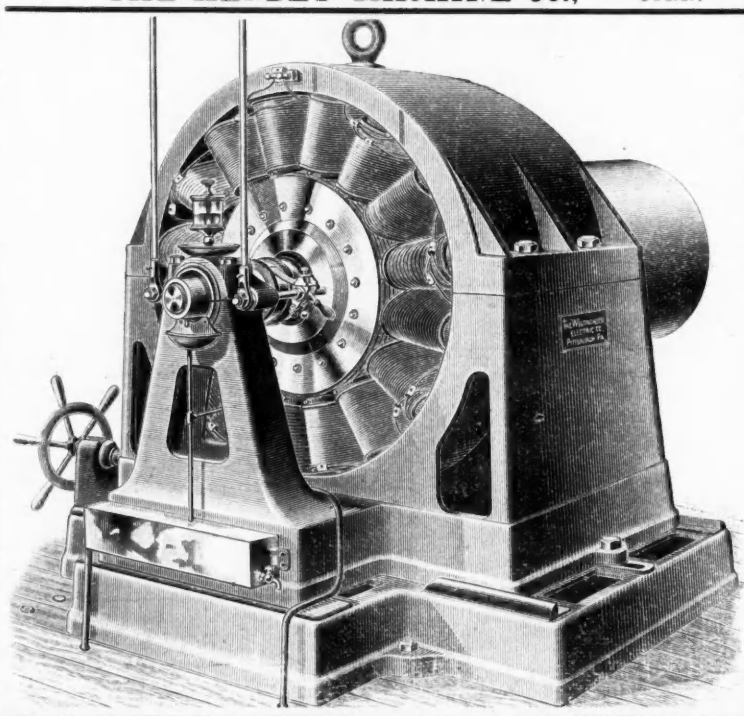
Our Illustrated Catalogue will be sent if desired.

THE HENDEY MACHINE CO., TORRINGTON, CONN.

THE ALTERNATING SYSTEM.

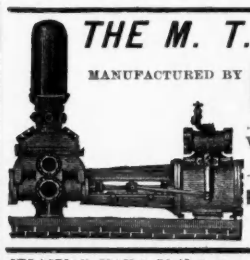
THE WESTINGHOUSE ELECTRIC CO.

Eastern Office, 17 Cortlandt St., New York. PITTSBURGH, PA.



THE M. T. DAVIDSON IMPROVED STEAM PUMP,

MANUFACTURED BY DAVIDSON STEAM PUMP COMPANY.



WARRANTED THE BEST PUMP MADE FOR ALL SITUATIONS.

PRINCIPAL OFFICE, No. 77 LIBERTY STREET, N. Y.

NEW ENGLAND OFFICE, 51 OLIVER STREET, BOSTON, MASS.

SEBASTIAN, MAY & CO.'S Improved Screw Cutting FOOT or POWER LATHES.

Catalogue of Lathes, Drill Presses and Machinists Tools and Supplies mailed on application. *Lathes on Trial.*

167 W. Second St., CINCINNATI, O.

STEEL BALLS FOR ANTI-FRICTION BEARINGS, OF BEST CAST STEEL.

HARDENED, GROUND & BURNISHED,

3-16" to 3" Diameter.

Samples and Prices on application.

SIMONDS ROLLING-MACHINE CO., FITCHBURG, MASS.

OIL CUPS

For Engines, Shafting, &c.

Illustrated Catalogue Free.

J. E. LONERGAN & CO.

Philadelphia, Penna

GUILD & GARRISON, BROOKLYN, N. Y.

STEAM PUMPS, VACUUM PUMPS, AIR COMPRESSORS.

SEND FOR CATALOGUE.

IF YOU WANT A STRONG, ECONOMICAL

ENGINE

EITHER HORIZONTAL OR VERTICAL,

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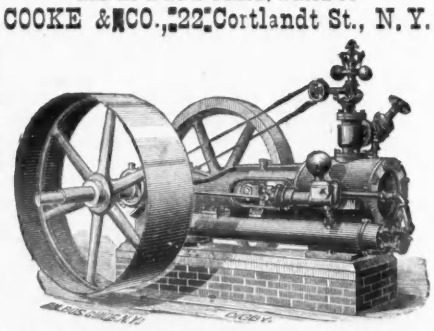

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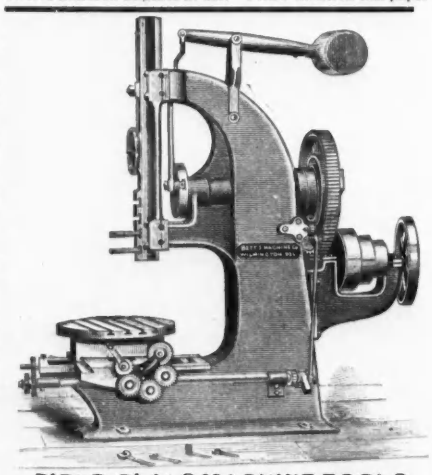

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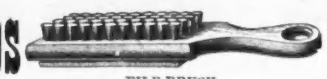
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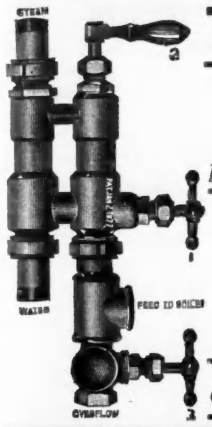

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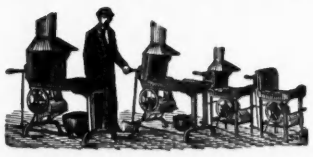

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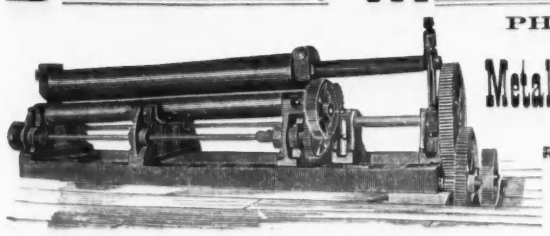

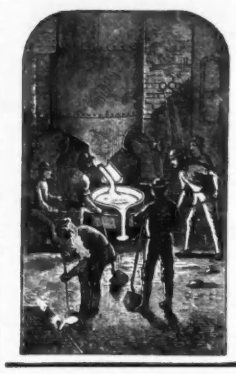

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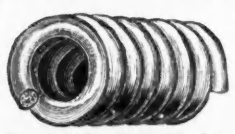

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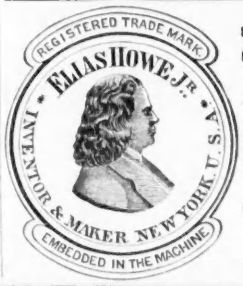

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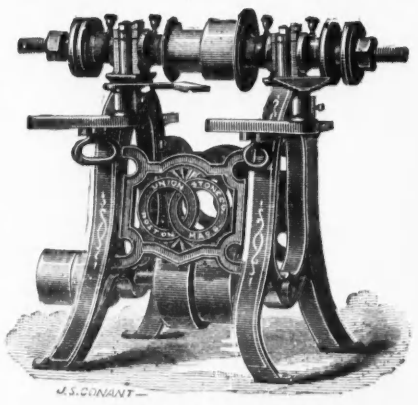

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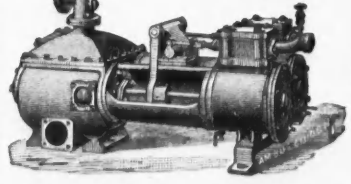

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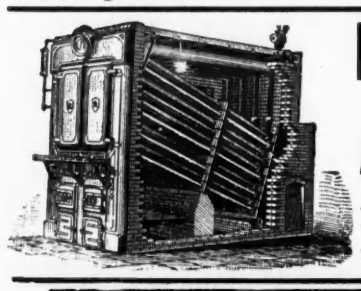
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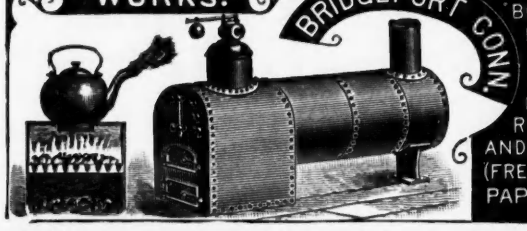

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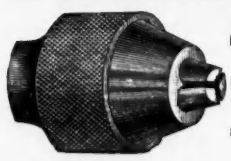
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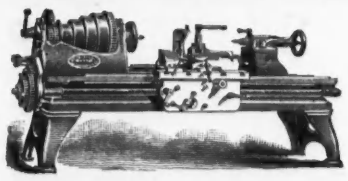
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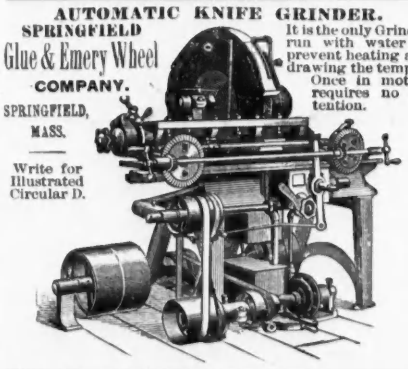
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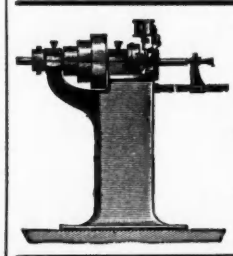
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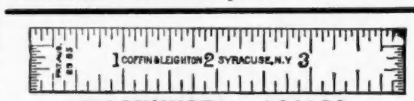

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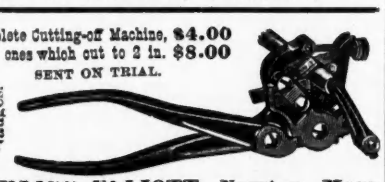
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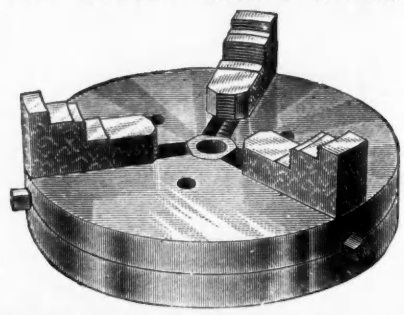
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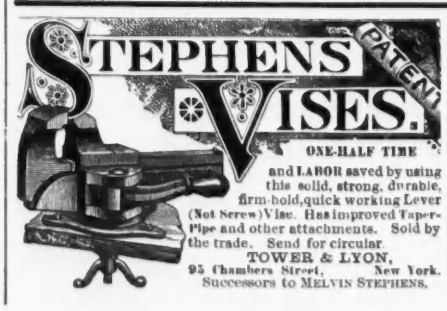

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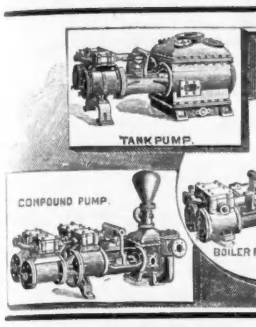

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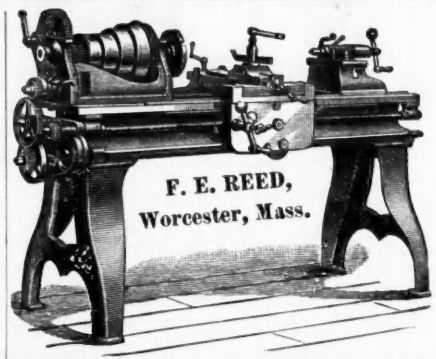

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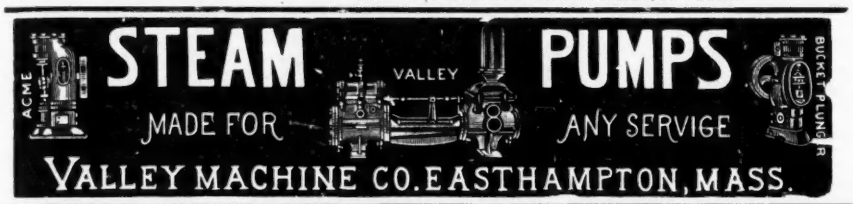

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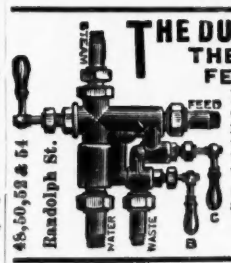

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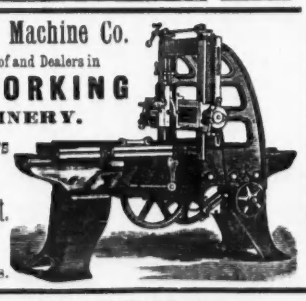

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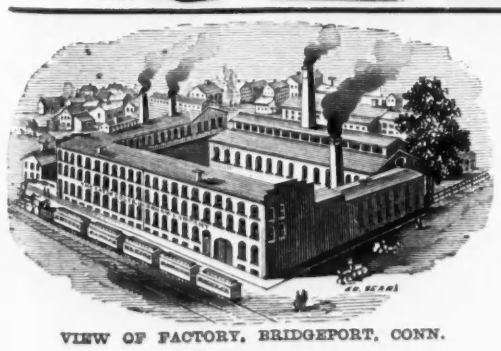

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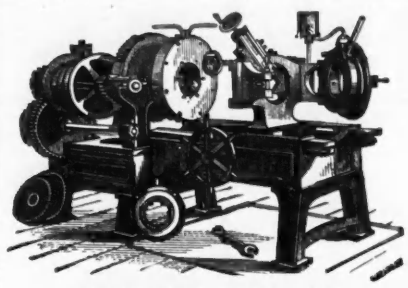

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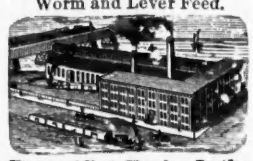

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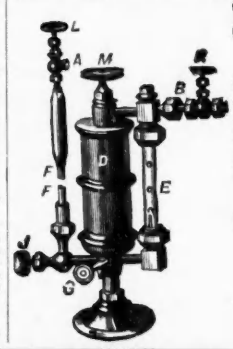

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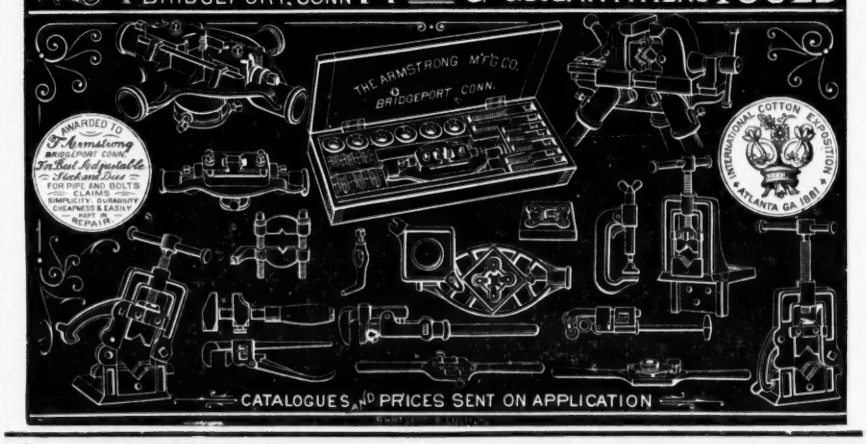

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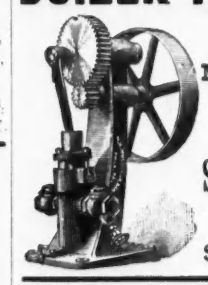

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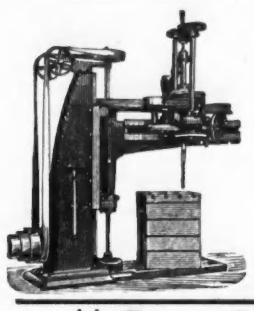

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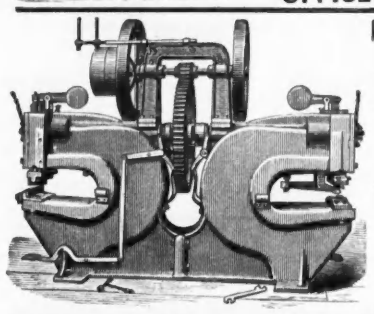

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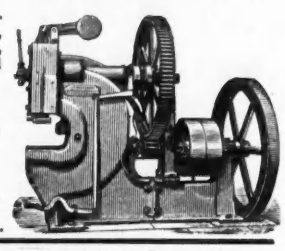

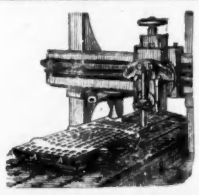

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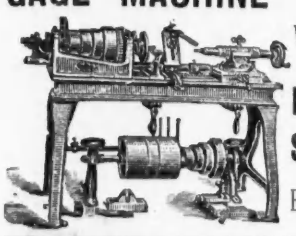

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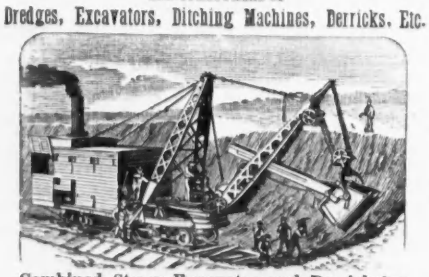

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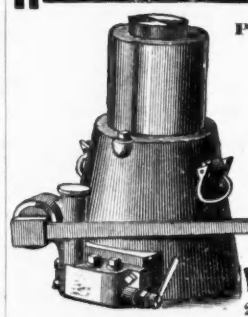

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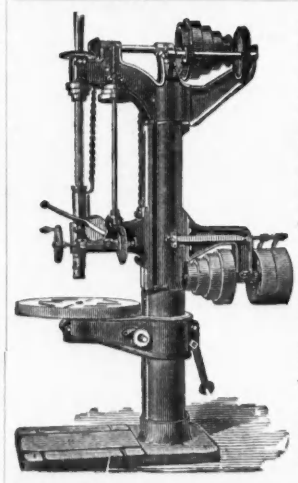

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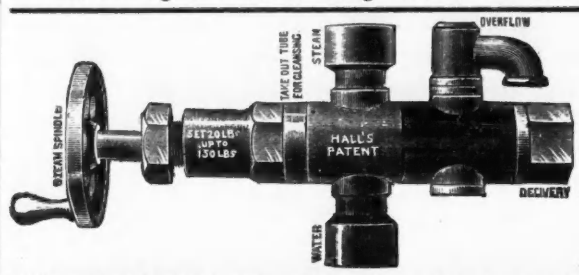

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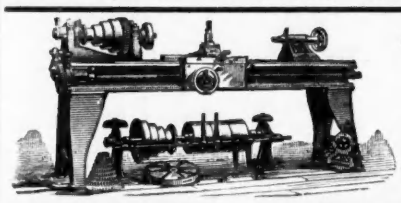

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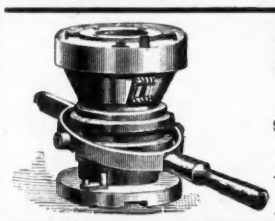

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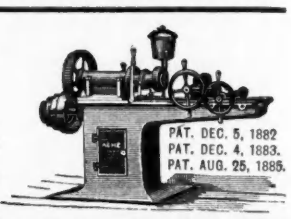

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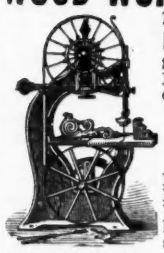

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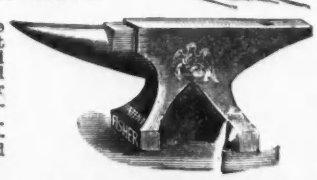

The Eagle Anvil.—Best Cast Steel Face & Steel Horn. Better than any English anvil. Fully warranted and lower price.

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New and Second Hand at great bargains.

Two	16"	swing,	6'	bed,	Engine Lathes (Porter),	new.
One	17"	"	8'	"	" (Wright),	"
"	24"	"	12'	"	"	"
"	18"	"	8'	"	"	second hand.
"	22"x 22"x 5'				Pond Planer,	"
"	30"				Swing Upright Drill (More & Wyman)	"
"	50	H. P.			Stationary Engine 14"x20" Cyl.,	new.
"	40	"			12' x20" "	"
"	30	"	"		10' x20' "	"
"	35	"	Center Crank		11' x15" "	"
"	25	"	"		10"x12" "	"
"	20	"	"		9"x16' "	sd. hd.
"	20	"	"		9"x12" "	"
"	30	"	Portable		10"x16' "	new.
"	20	"	"		9' x12" "	"
"	15	"	"		8"x12" "	"

Also large stock of new and second hand Engines and Boilers. Correspondence solicited.

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McKinley Patent **Air Engine.**

The Best and Cheapest on the Market.

No Steam. No Water. Absolute Safety. No Engineer. No pumps. No Gauges. No liability to freeze up. No Regulation required.

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Can be used for any purpose where power is required.

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This Hammer possesses advantages superior to any other in the market. It has neither cylinders, valves or piston rods, consequently repairs are trifling. It takes up less space, less power to drive; strikes much harder and truer blows than hammers with double the weight of ram.

It can be worked to strike good alternate blows on a 3-inch and ⅜-inch bar when a 100-pound hammer is used, and can be used on die work to a far greater advantage than any other hammer known. Manufactured by the

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BY

POOLE & HUNT, Baltimore, Md.

1 Planing Machine. Will plane 35 in. wide, 27 in. high, and 16 ft. in. long.

1 Planing Machine. Will plane 30 in. wide, 26 in. high, and 5 ft. 6 in. long.

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1 Double Geared Chasing Lathe. Will swing 24 in. dia., 8 ft. 6 in. long.

1 Drill Grinding Machine. Made by Wm. Sellers & Co.

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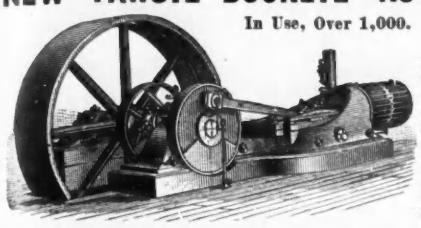
In Use, Over 1,000. 25 to 1,000 H. P.



These Engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and superior regulation guaranteed. Self-contained Automatic Cut-off Engines 12 to 100 H. P. for driving Dynamo Machines *a specialty*. Illustrated Circulars, with various data as to practical Steam Engine construction and performance, free by mail. **Address, BUCKEYE ENGINE CO., Salem, Ohio.**

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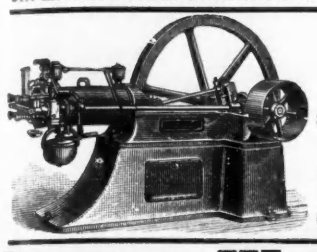

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OVER 20,000 ENGINES IN USE.

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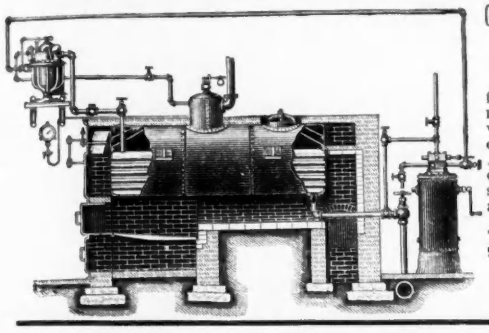

Guaranteed to Absolutely Prevent Formation of Scale in Steam Boilers.

Automatically takes water from the boiler, filters it, and returns it in pure condition, thus removing scale-making impurities from the water, and maintaining a free and steady circulation. Combines the well-known Albany Steam Trap with a Filter of novel construction, which has no rival in point of simplicity, facility for cleaning, and assurance against clogging of sand valve.

We also manufacture the **Albany Steam Traps** and **Blessing's Patent Renewable-Seat Stop and Check Valves.** Send for Circular.

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From 1-4 TO 15,000 lbs. WEIGHT.

True to Pattern, sound, solid, free from blow-holes and of unequaled strength

Stronger and more durable than iron forgings in any position or for any service whatever.

40,000 CRANK SHAFTS and 30,000 GEAR WHEELS of this steel now running prove this.

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PORTABLE AND STATIONARY ENGINES and BOILERS

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NEW AND SECOND-HAND.

12 in. S., 5 ft. Bed Engine Lathe, New
13 in. x 6 ft. Bed Engine Lathe, Ames, new.
14 " 7 ft. Bed Engine Lathe, Bogert new
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19 " 12,14" " " Pond, nearly new.
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24 " 12-14 and 20 ft., Ames, new
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16x42 in. Bridgeport. 24 in. x 6 ft. Hendey, New.
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PATENT UNIVERSAL SCREW-CUTTING, CENTER, DEPTH ANGLE AND TWIST DRILL GAUGE.

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Fine Machinists' Tools, E, BOSTON, MASS. Send for Circular.

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We are now making from entirely new designs, *extra heavy* 19" and 21" Engine Lathes (the most popular sizes), of which we are making a specialty, and manufacturing in lots of not less than 100 at a time.

We make no charge for extras. Every lathe is furnished with *hollow spindle*, the 19" with 1⅝" hole, and 21' with 1⅞" hole. Every lathe has substantial *compound rest*, heavy tool post (bar steel), rest to turn full swing, *following rest* with adjustable jaws to take any size from 2½' down, with extra tool for shafting.

Full set of gears to cut from 2 to 18 threads including 11½ pipe thread. *Automatic stop on carriage. Separate screw and rod feed*, and the most substantial and easily managed *taper attachment* made. Cones and gears of large diameter and wide belt. Studs, screws and small gears are *steel or gunmetal*. Webbed live heads, heavy tail stocks. No worm or worm gears, no weak reverse plate. *Perfect lubrication for all running parts*, including carriage.

Lead screw inside of shear, double nut (cut from solid), and taking hold of carriage directly under the line of strain. Friction counter-shaft, the most durable made. Our prices are reasonable for cash, and from which no deviation will be made. Our written guarantee accompanies every lathe.

GUARANTEE.

We guarantee this lathe to be equal in workmanship, truth, accuracy, solidity, material and finish, to the best made, and hold ourselves legally liable for this guarantee.

LODGE, DAVIS & CO.

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Machine Tools,

159, 161, 163 and 165 EGGLESTON AVE.,
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(See our advertisement on last page.)

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MANUFACTURERS OF IMPROVED CORLISS STEAM ENGINES IN FULL VARIETY.

Sizes Varying From

30 to 2000 Horse Power.

Horizontal or Vertical, Direct Acting or Beam, Condensing, Non-Condensing or Compound.

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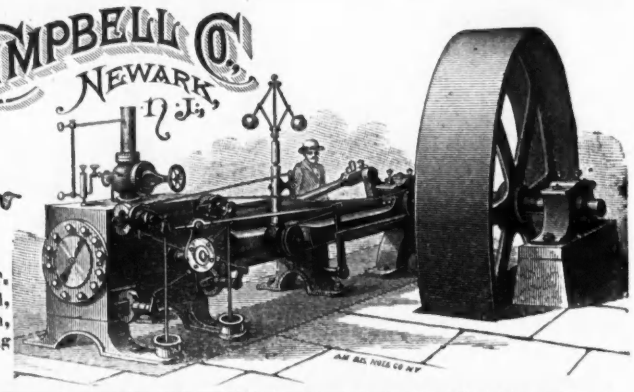

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High Pressure, —Condensing— and Compound.

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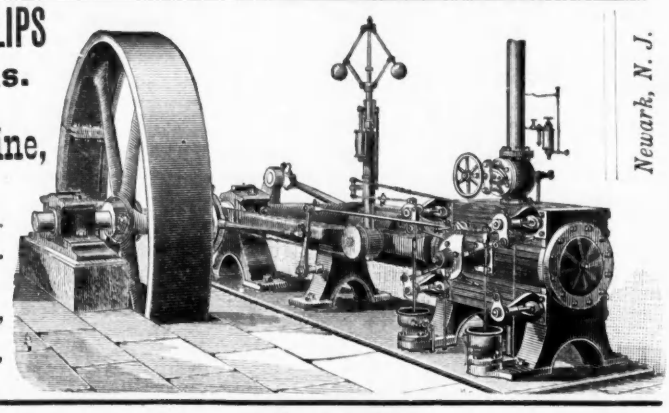

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BUILT BY THE FISHKILL LANDING MACHINE CO.,

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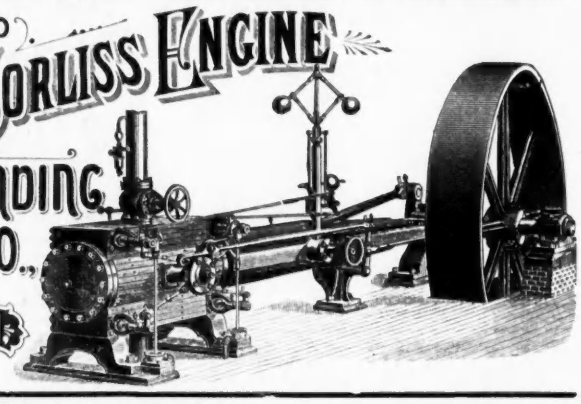

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ALSO SLIDE VALVE ENGINES

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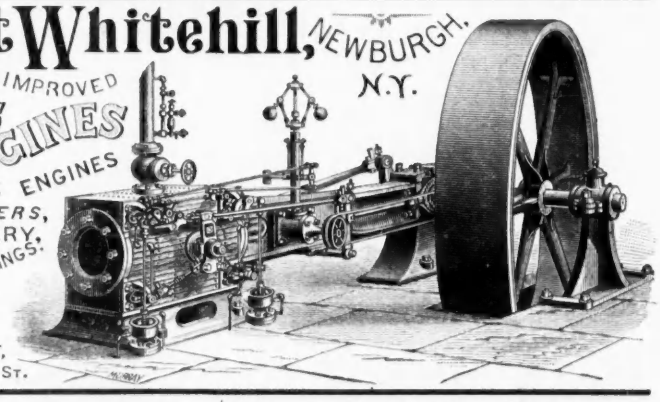

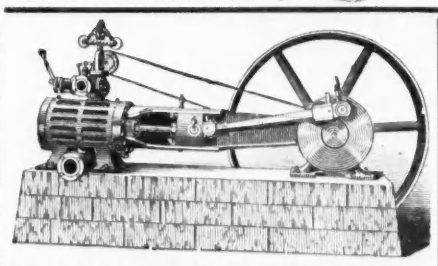

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Engines from 15 to 400 Horse Power.

Boilers of Steel and Iron supplied to the trade or the user. Send for Catalogues.

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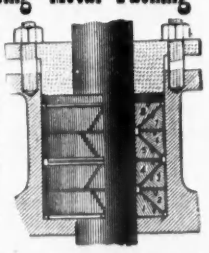
For Piston Rods, Valve Stems, etc., of Steam Engines, Pumps, etc., adopted and in use by leading engine builders, mills, iron works and steamship companies all over the world. Also flexible tubular metal packing for slip joints on steam pipes, and for hydraulic pressure.



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GLEASON IRON PLANERS.

(New Heavy Patterns.)

"OUR BEST."

Powerful and Noiseless, Splendid Workmanship.

LIST OF LARGE SIZES.

36 Inch,	**to plane any length up to**			**20**	**Ft.**
40 Inch,	"	"	"	**20**	"
42 Inch,	"	"	"	**26**	"
48 Inch,	"	"	"	**26**	"
60 Inch,	"	"	"	**26**	"
72 Inch,	"	"	"	**26**	"

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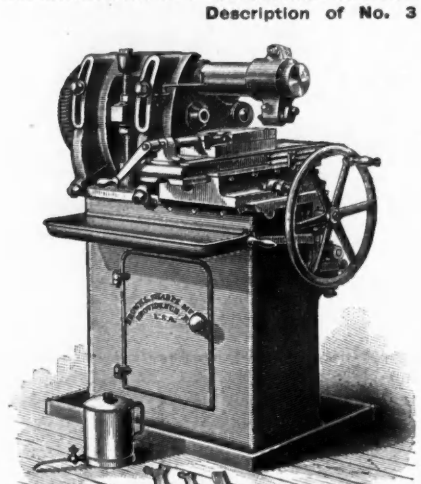
BROWN & SHARPE MFG. CO.,

Manufacturers of MACHINERY & TOOLS, PROVIDENCE, R. I.

Description of No. 3 Plain Milling Machine.



We have in our works and in constant use, about one hundred Milling Machines, and our experience with them has demonstrated that for manufacturing purposes where many duplicate pieces are required, that the best work is produced and the most economical results obtained from machines that are compact and solid, so arranged that the pieces operated upon can be quickly placed in position and quickly removed after the cut is taken.

We have designed a line of Milling Machines for manufacturing purposes, combining the above desirable qualities, of which the No. 3 Plain Milling Machine is a type, and by their use we have found it practicable to produce from 10 to 20 per cent. more work in a given time than we could possibly obtain from any other type of a milling machine on the same work.

The Spindle is driven by a gear and pinion from a three-step cone with 3″ belt. It has a vertical adjustment of 6″.

The Table is 9″ wide, 27″ long, and has 12″ longitudinal and 4½″ transverse movement, and is moved longitudinally 2″ by one turn of the hand-wheel.

The Feed is automatic with three changes, stopping automatically at any required point.

The Vise has jaws 6⅛″ long, 1 7-16″ deep, and will open 3⅝″.

Counter-shaft has pulleys 10″ diam. for 3″ belt, and should run about 375 turns per minute.

The Price includes vise, counter-shaft, wrenches, &c., delivered f. o. b. at Providence, R. I. Weight, 2550 lbs.

Car Wheel and Axle Machinery.

RAILROAD, LOCOMOTIVE AND CAR SHOP

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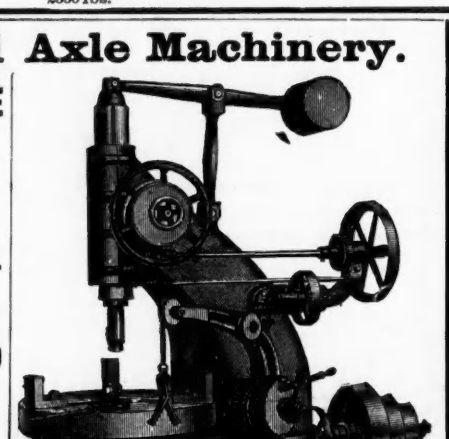

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FOR HAND OR POWER.

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PARTICULARS ON APPLICATION.

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NEW YORK–CHICAGO–PHILADELPHIA–BOSTON.

ENGINE LATHES, SHAPERS & DRILLS.

20 in. Upright Drill.
24 " " "
26 " Back Geared and
30 " Power Feed
38 " Drills.

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Send For Prices. It Will Pay You.

(See special notice of Engine Lathes on page 15.)

E. GOULD & EBERHARDT,

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Eberhardt's New Drill

Turns out 50 per cent. more work than any other.

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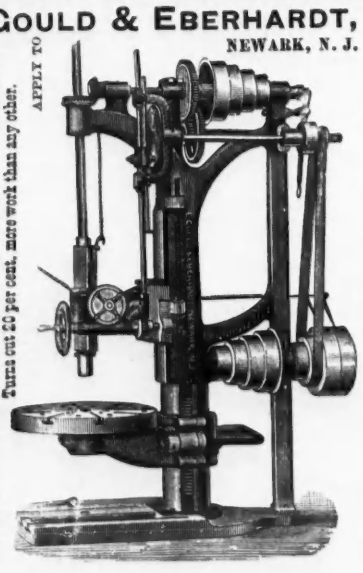

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Universal Milling Machine.

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Lathes, Planers, Milling Machines and Drills. Special Tools for all kinds of manufacturing to order. Gear and Rack Cutting, Milling and Index Drilling to order.

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Manufacture and have ready for delivery, TURRET HEAD MACHINES of 10, 12, 14, and 16 in. swing, with or without cut-off rest, suitable for finishing brass and other metals that do not require a free use of oil in cutting them. Prices are less than for screw machines, and will be given on application. The CUSHMAN PATENT COMBINATION LATHE CHUCKS are made stronger than formerly, have jaws ground true, and are offered at 35 per cent. discount from list.

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DROP FORGINGS IN COPPER, IRON OR STEEL.

Pure Copper Commutator Bars for Electric Motors or Generators, Steel Commutator Rings and Nuts, Steel Wrenches and Eye Bolts.

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MACHINE TOOLS

For Iron and Brass Work.

SMALL TOOLS & FIXTURES.

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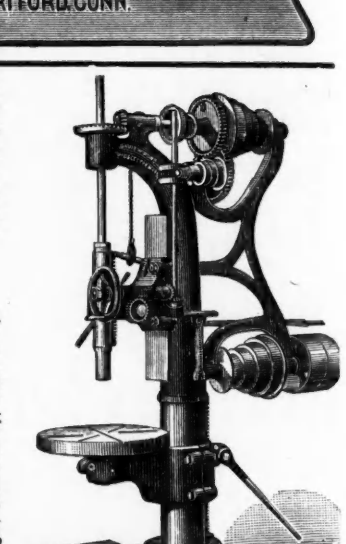
New Designs, Quick Delivery, Great Variety. WORCESTER, MASS.



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FROM 16 to 48 IN. SWING.

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GEAR WHEELS & GEAR CUTTING

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KEY SEATING MACHINES

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20 in. Drills a specialty.

Our 20 in. Drill is a heavy substantial tool, made for service, has steel shafts and spindle. Gears and racks cut from the solid and have all modern improvements, are made by special machinery, and sold very low.

Our Key Seating Machine will save enough in 60 days' use to pay first cost; no shop can afford to do without one. We have now ready for prompt shipment, both Key Seat Machines and 20 in. Drills. Send for Photo. and Catalogue.

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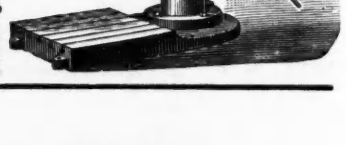

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PRATT & LETCHWORTH, Proprietors.

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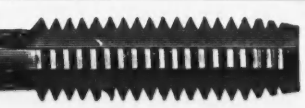
Destroyed our works one month ago; but we are so far recovered from its disastrous effects as to be able to announce to the public our readiness to receive orders. We have secured buildings for temporary use adjoining the ruins, into which we have already put over $30,000 worth of new machinery, the best that could be obtained, and are again ready for business.

We desire to express our thanks for the liberal patronage bestowed upon us in the past, and respectfully solicit a continuance of the same.

THE STILES & PARKER PRESS CO.

Middletown, Conn., Mar. 4th, 1887.

J. M. CARPENTER
PAWTUCKET, R. I.



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